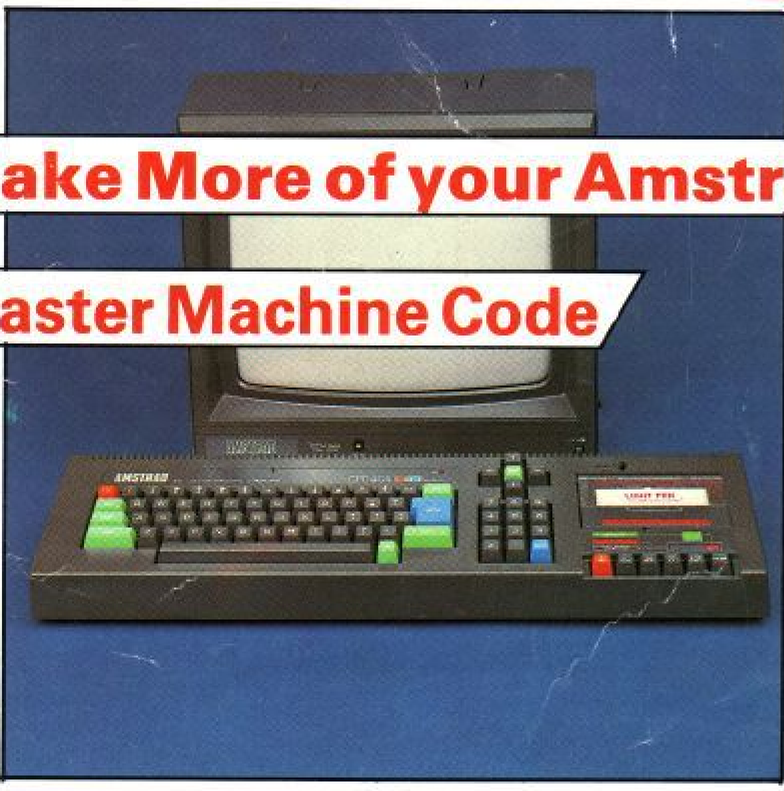
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95p

November 1985

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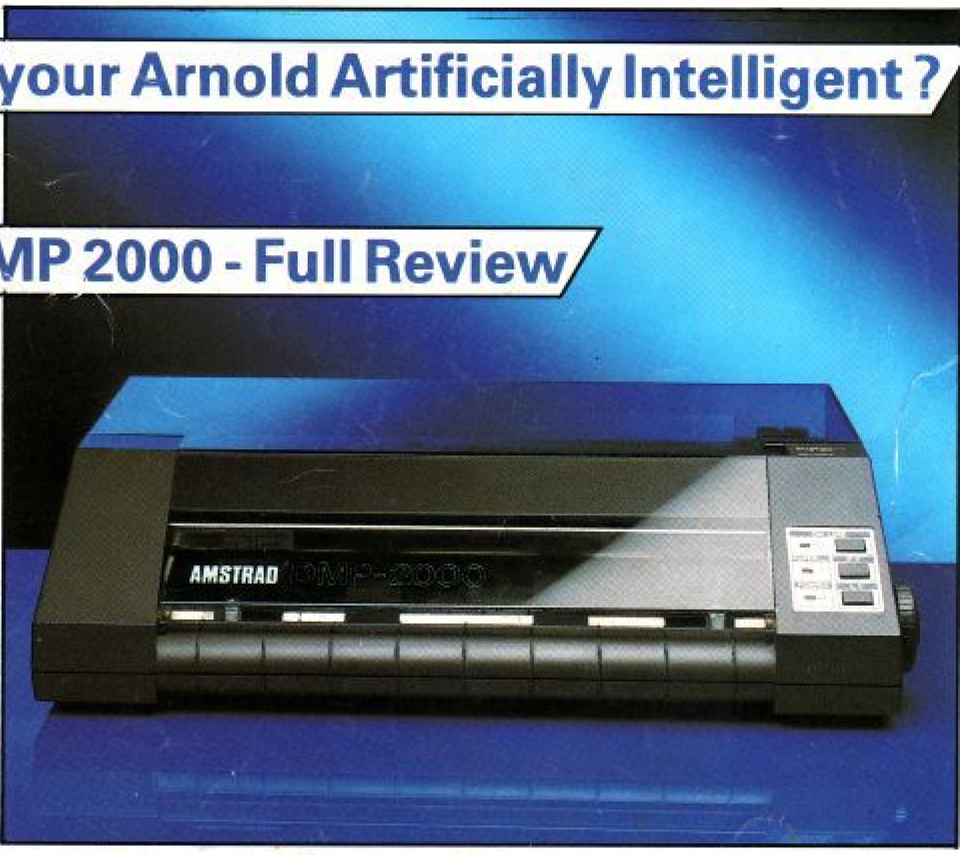


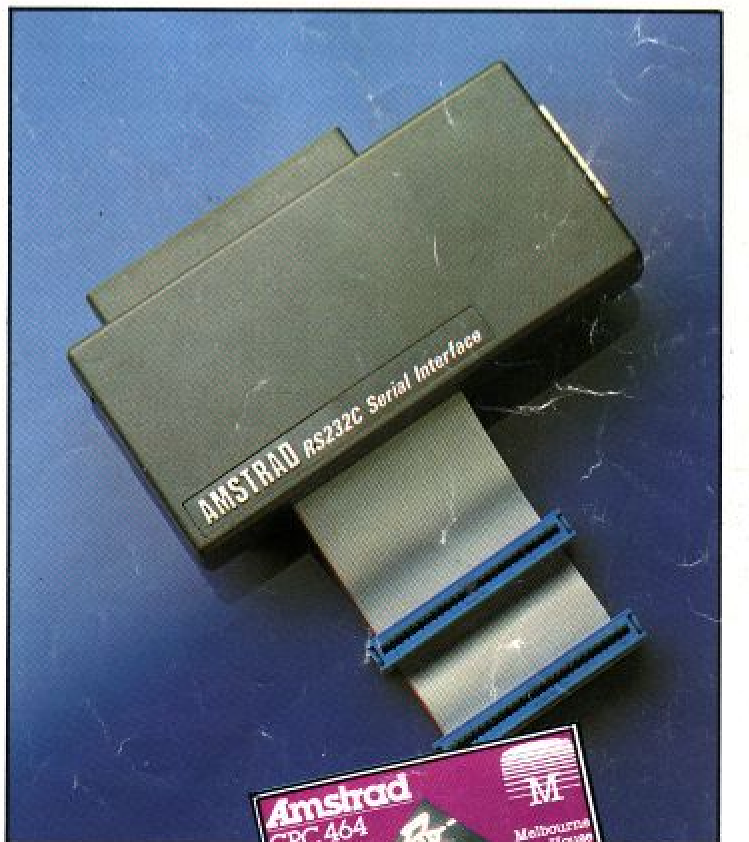
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Trivia

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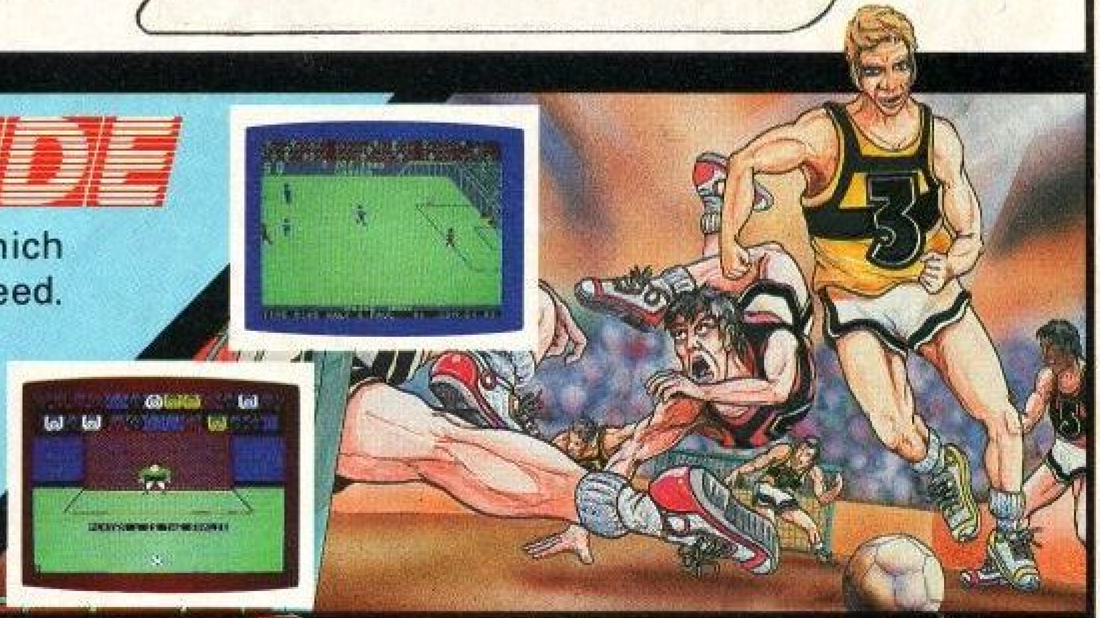
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Atari - Spect - Electron SOON

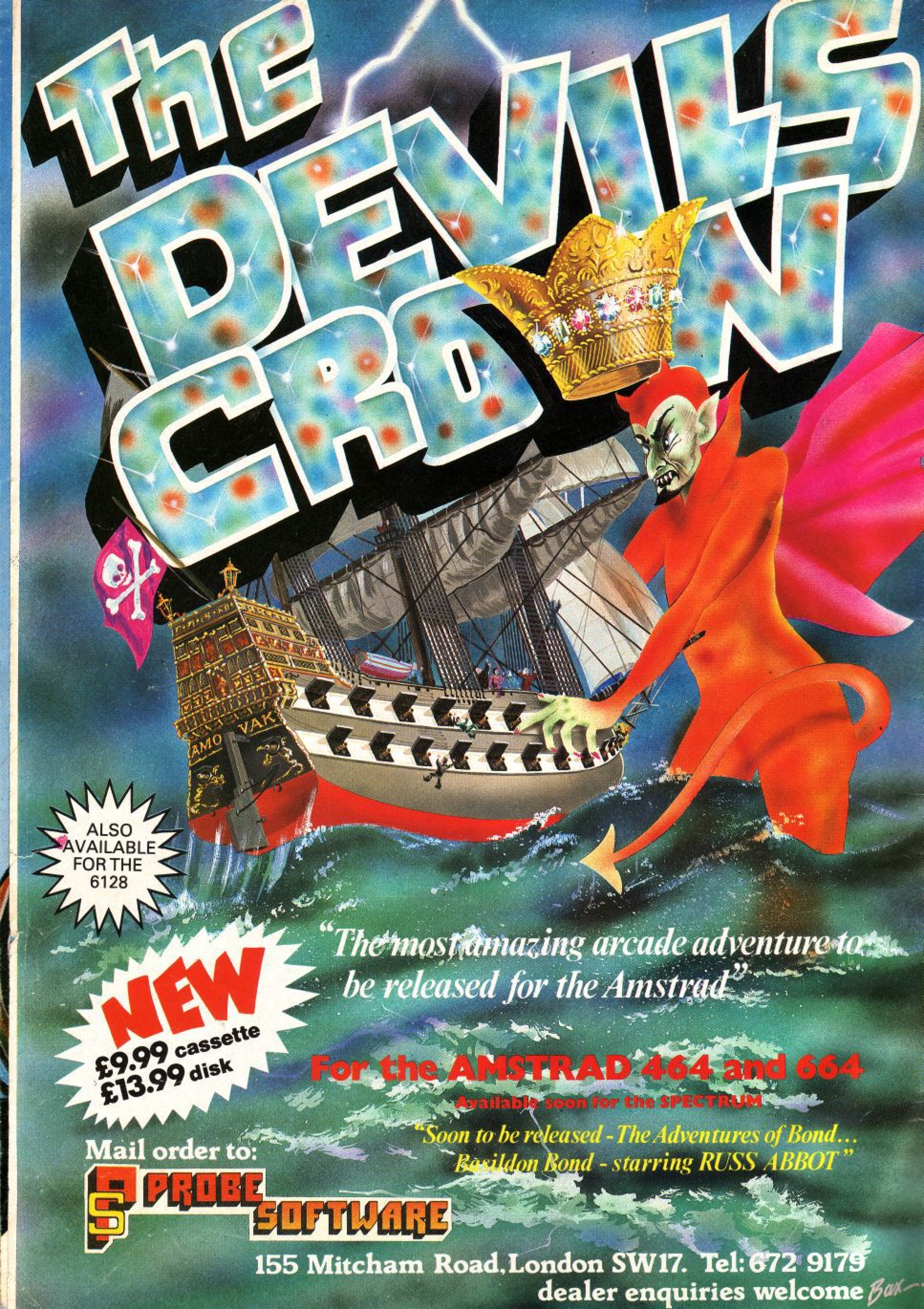


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AMSTRAD COMPUTER USER

Regulars

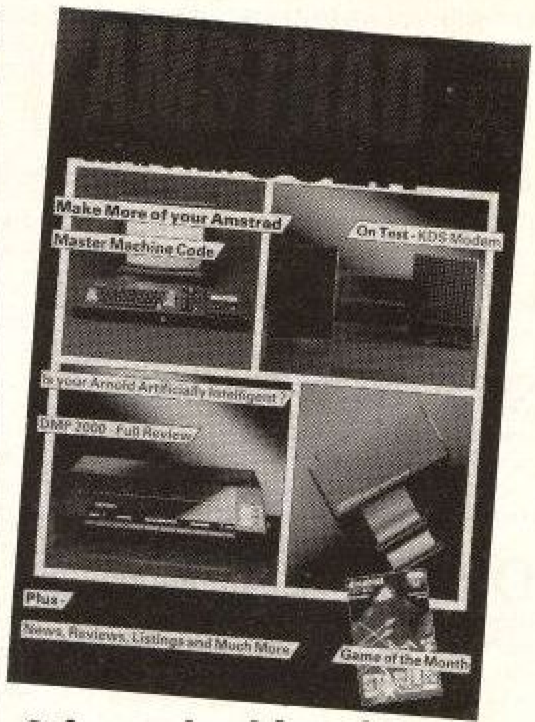
Reviews

Features

Listings

Competition

Amstrad User is the OFFICIAL magazine for users of the Amstrad CPC 464/664 and CPC6128. It is published monthly, the next issue will be on sale from November 14th 1985. Back issues are available from Amsoft Mail Order at £1.20 each (including postage). Issues 1,2 and 3 are sold out. Overseas readers should contact Garwood Wholesale (0277) 823 747



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User News...

New Modem From GEC



The new Datachat modem takes the Amstrad philosophy of one plug for the system to its logical extreme. This modem has no mains plug at all. Instead it takes its power from the 'phone line. This makes the modem much neater, if a little more expensive than its rivals. The modem will only operate at 1200/75 baud or 75/1200. Unlike many of the new flexible modems, the GEC Datachat 1223 is fully BT approved. It will cost £89.95. In the near future there will be auto answer and a (mains powered) auto dial version.

Amstrad Teletext

Both the BBC and ITV offer free teletext sevices, usually these are fed into a special television so that you can call up the information. It is now possible for you to buy an adaptor so that a teletext screen can be read into an Amstrad computer. Volex Electronics have produced the device called the TTX 2000A. This will allow viewers to select, save, print or view a frame whether directly or under program control. All you need is the adaptor and a television aerial. It is even possible for you to write a program to pluck the information off and amalagamate such things as exchange rates to plot a graph of changes.

Future plans include telesoftware, free software which can be simply downloaded. Volex can be contacted on 061-736-5822

Amsnet

Viewfax is to provide Prestel users with a special database for Amstrad users. Called Amsnet it opens at the beginning of October and will carry news, information, hints and tips for Amstrad Users. Amstrad Computer User will provide some of the information for Viewfax to display, just to make sure that they get the best stuff. It will be possible for users with appropiate software to download programs. To connect your computer to Amsnet you will need a serial interface, such as the Amstrad RS232 interface, a modem and a telephone line. For details of the telesoftware downloader contact Honeysoft on (0277) 217306.

Dr Watson Winners

And now we are going to announce the winners of our August competition. These thirty lucky winners will shortly receive their own copy of the Dr Watson series books 'Amstrad Assembly Language Course': M R Cuffe of the Isle of Wight, Martin Broughton of Wells, Maureen Rust of Kings Lynn, Malcolm Fortune of Co. Meath, Darren Ballard of Banbury, Mr N Timms of Wigtownshire, Gary Buxet of Gosport, Alan Smith of Braintree, L J Coughtrey of Lancaster, David Bon of Co. Durham, Mark Swinson of Hacth End, Timothy Riley of York, G P Kendall of Hitchin, Stuart Phelps of Chippenham, Mr S Gautama of Ilford, Ravi Godbole of Bracknell, S Brant of Catterick, Marcus Passant of Wolverhampton, Paul Higginson of Bolton, Keith Greenan of Co. Dublin, Richard Holt of Teignmouth, B Letts of Fareham, Graeme Bird of Ashington, Mr M Pickin of Alton, Mr D Coles of New Malden, Stephen Norman of Bath, Mr G Anderson of Barry, Jason Fisher of Co. Down, Mr D Symons of Shaftesbury, Tony Brown of Newport.

The Adventure for Teckies

Despite protests from early users of the term, a 'Hacker' is now generally accepted as someone who breaks into mainframe computers by using a modem, luck and skill. Seen by some as criminals and by others as folk heros, they are certainly newsworthy. Activision have based an adventure game around the theme of hacking. Given the barest essentials of information, you have to log into a fictious computer and explore its memory. In order to play you don't even have to have a modem - Just a devious mind.



Who goes There

Micro Power, the software house which is well known for utility ROMs has moved into the games market with a spectacular new title. 'Doctor Who and the Mines of Terror' is a huge ladders and platforms game. You play the part of the Doctor, fighting to prevent a device capable of recording and editing time from falling into the wrong hands. The game is huge, it has a very large scrolling map and come complete with a full set of playing hits, a blueprint map of special sections, a speccial decoder card and an invaluable help envelope. Available from the 17th October 'Doctor Who and the mines of Terror' will cost £14.95 on tape with a disc version to follow.

PCW-8256 Makes Friends Quickly.



There is already a lot of support for the new Amstrad Wordprocessor, the PCW-8256 (known as Joyce) is now avaliable through Dixons and independant retailers. Dixons have a special demo disc and staff have been trained to make the most of Joyce. They will explain how it suits your needs and what software you can run. Business computers need a lot of support and Dictaphone have stepped in with a maintainance contract which means that, even if your local dealer cannot offer rapid servicing, he can sell you a contract which will ensure that an engineer will be round to nurse your Joyce within 24 hours and with a usual time of 8 hours. This five star service will only cost £36 per year.

HiSoft, long time friends of Arnold have added Joyce to the range which will run their programs. They have Pascal80, Devpac80 and The Knife ready to run on the PCW-8256. More details from HiSoft on 0582 696421.

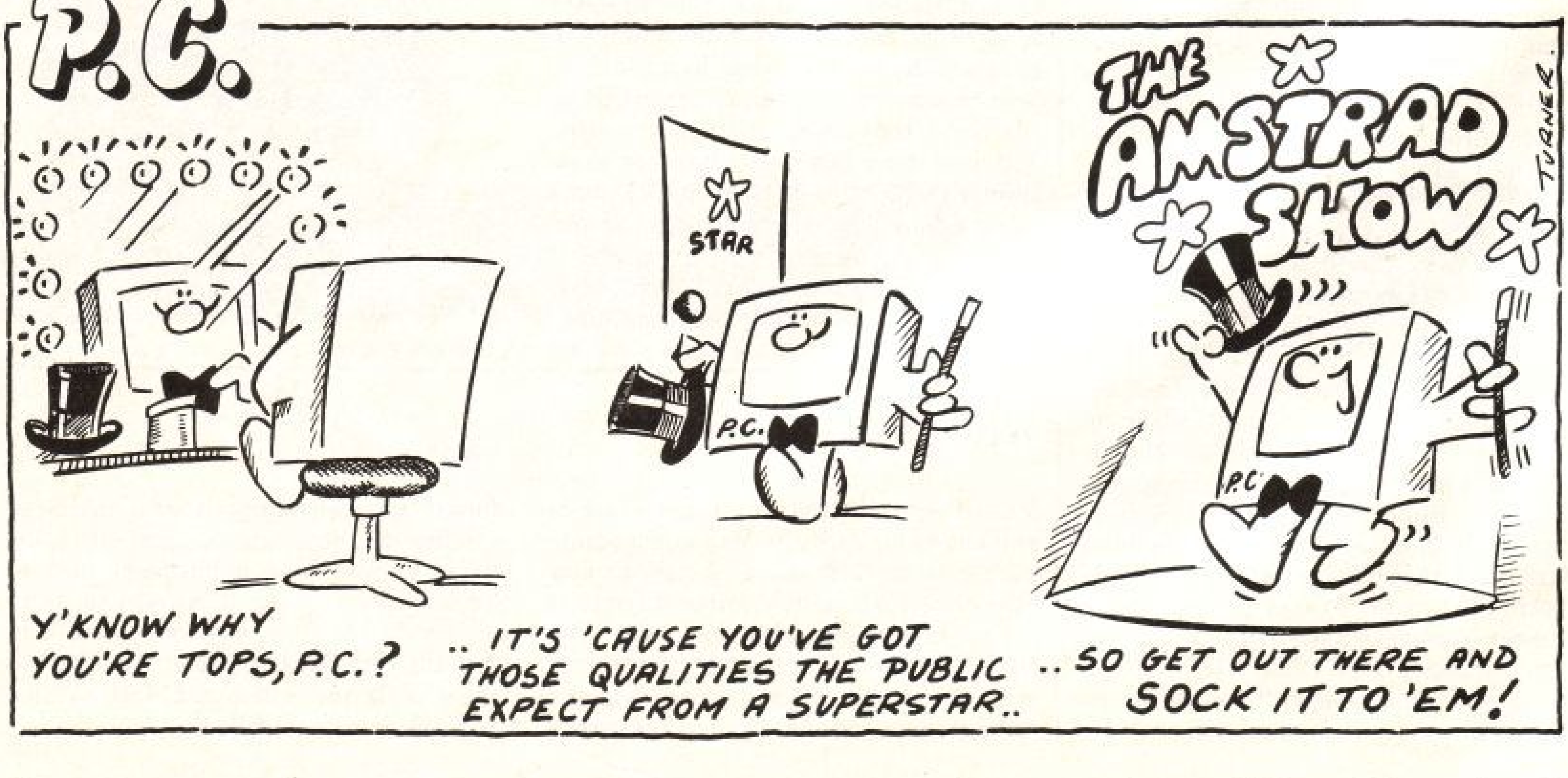
Newstar software have a huge range of CP/M software installed for the Joyce, contact them on 0277 823747 for details.

Bargain Compilation

The battle lines are being drawn to produce the number one selling game at Christmas. Hitsville is the name of the label for a dual tape compilation called 'They Sold a Million'. This will contain four programs which have had combined sales in the past of over 1,000,000 tapes. The Amstrad user does particularly well out of this since two of the games have not been released on the Amstrad before. The games are 'Daley Thompson's Decathlon', 'Bead Head', 'Jet Set Willy' and 'Atic Atac'. Just to confuse things, the version of 'Jet Set Willy' is a conversion of the Spectrum program and not the enchanced Amstrad game which was called 'Jet Set Willy - The final frontier'. The tape will sell for £9.95 and the disc for £12.95 which makes the whole thing worthwhile even if you only want two of the four programs.

Fangs for the (128k) memory?

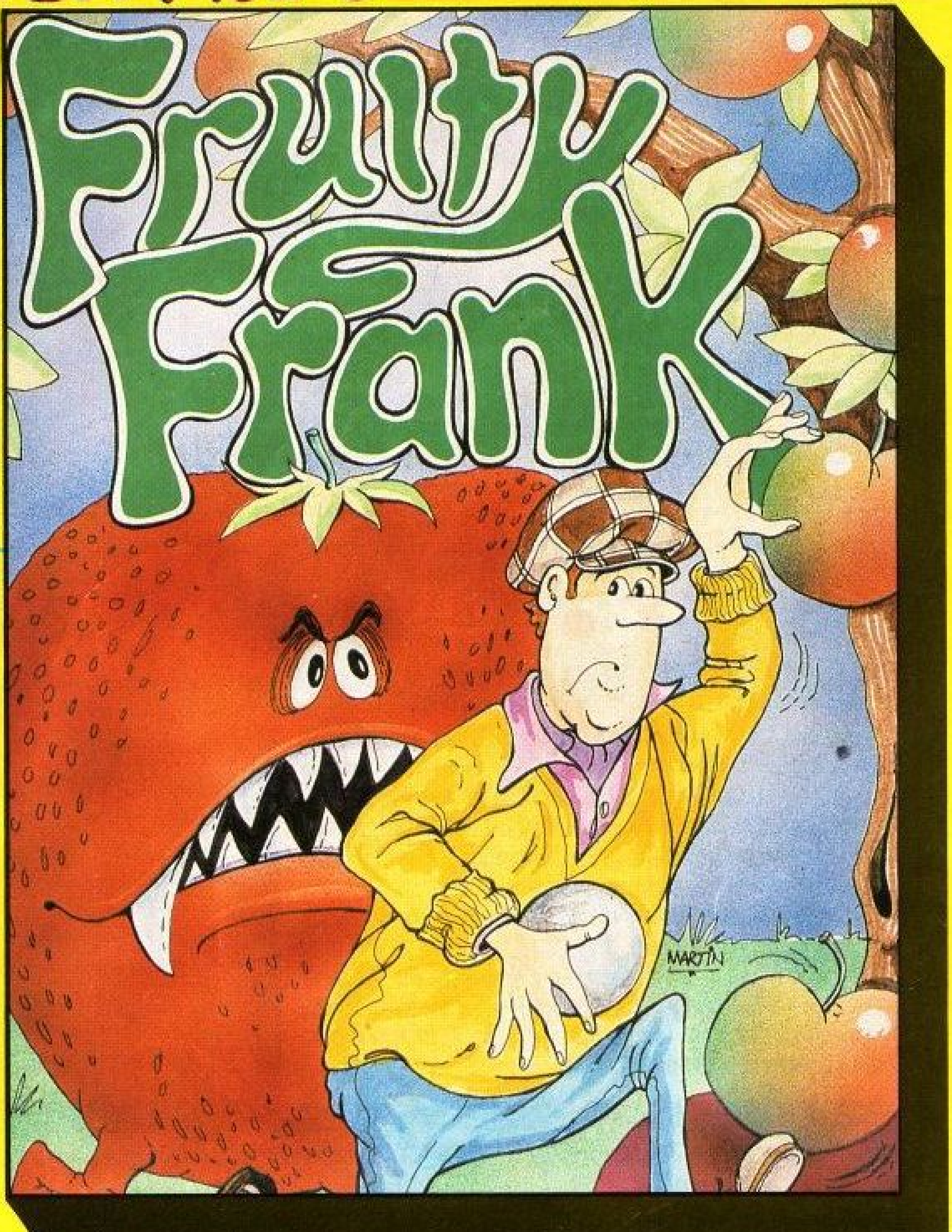
Aha! A package for dental surgeries that uses the Amstrad CPC6128 bank manager has been released by Dentron Computing Limited (01 328 4791). The system is offered as a vertical package with the CPC6128 and Brother M1009 printer, and provides facilities specifically to cope with new NHS regulations applicable to dental practises from October 1985. More details soon.



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Who is the the Amstrad User?

In the July issue we ran a survey to see what Amstrad Computer User readers want from Amstrad Computer User, the first results are now available. They make interesting reading and show that users of Amstrad computers have much more diverse interests than we expected.

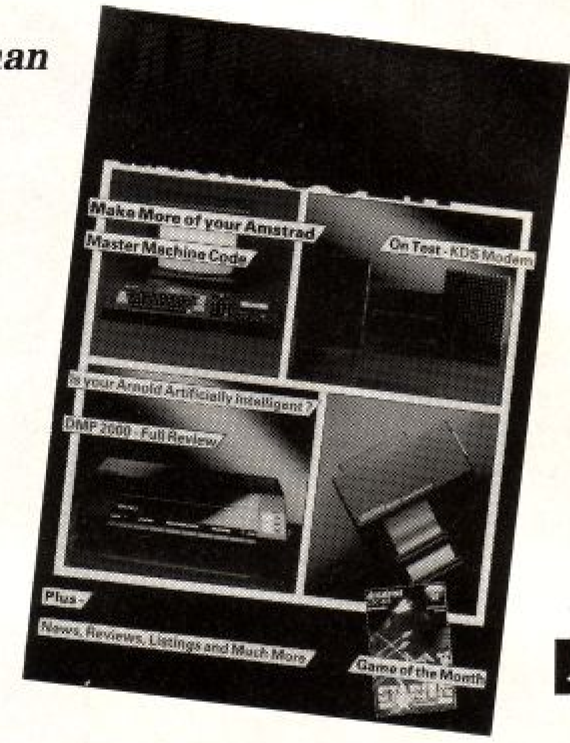
There is a very broad age range, most readers are either around 17 or over 30 years old, not very many have a disc drive although there are quite a large number who intend to buy one, this along with the lower price of the DDI-1 and the new 6128 means that the magazine will be following the trend to use disc systems.

Amstrad User readers enjoy using their machines, so we will be increasing the number of listings, although I doubt that we will ever list anything quite as long as 'Splatch' again! We will also include more for the business user. Reviews of spreadsheets, graphics programs and business software with a special emphasis on the 6128 and Joyce (PCW8256).

The amount of space devoted to games will not be reduced, however, the number of games reviewed will drop. In the past, we have tried to review every major game available for the Amstrad, now there are more games available than we can do justice to. Future reviews will be longer and more detailed with only the better games being covered. This will give the dedicated games player a better deal. More maps, more pokes and better playing tips. Our reviewers promise to wear out joysticks faster than anyone.

This may all sound like one long advert for Amstrad Computer User, in a way it is, but really this is a vote of thanks to all the readers who responded to our survey.

Simon Rockman



ACU

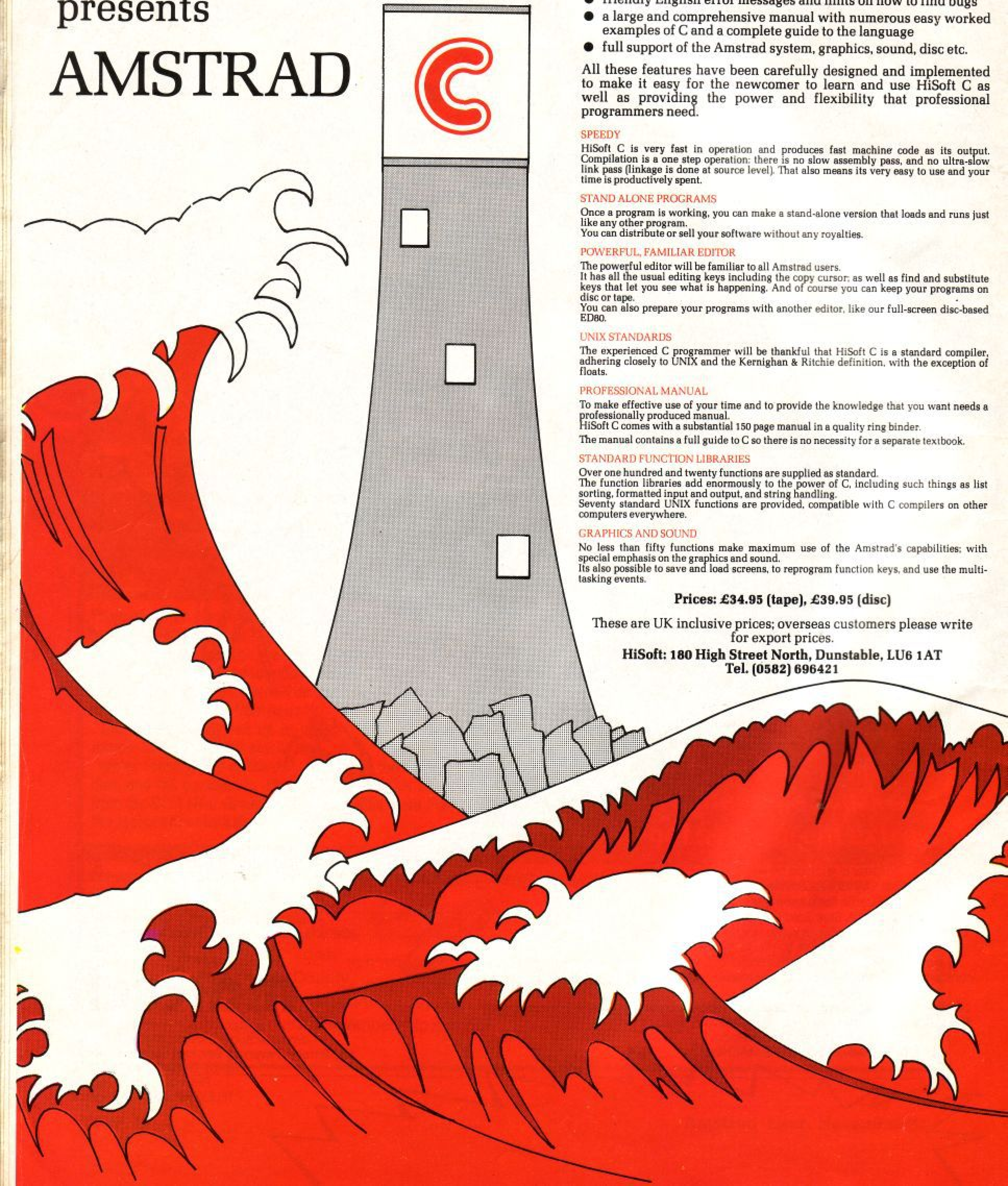

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- a conversion guide making available in C all the functions familiar to a BASIC programmer
- a unique "direct-mode" allowing you to test out programs exactly like BASIC
- friendly English error messages and hints on how to find bugs
- a large and comprehensive manual with numerous easy worked examples of C and a complete guide to the language
- full support of the Amstrad system, graphics, sound, disc etc.

All these features have been carefully designed and implemented to make it easy for the newcomer to learn and use HiSoft C as well as providing the power and flexibility that professional programmers need.

SPEEDY

HiSoft C is very fast in operation and produces fast machine code as its output. Compilation is a one step operation: there is no slow assembly pass, and no ultra-slow link pass (linkage is done at source level). That also means its very easy to use and your time is productively spent.

STAND ALONE PROGRAMS

Once a program is working, you can make a stand-alone version that loads and runs just like any other program.
You can distribute or sell your software without any royalties.

POWERFUL, FAMILIAR EDITOR

The powerful editor will be familiar to all Amstrad users.
It has all the usual editing keys including the copy cursor; as well as find and substitute keys that let you see what is happening. And of course you can keep your programs on disc or tape.
You can also prepare your programs with another editor, like our full-screen disc-based ED80.

UNIX STANDARDS

The experienced C programmer will be thankful that HiSoft C is a standard compiler, adhering closely to UNIX and the Kernighan & Ritchie definition, with the exception of floats.

PROFESSIONAL MANUAL

To make effective use of your time and to provide the knowledge that you want needs a professionally produced manual.
HiSoft C comes with a substantial 150 page manual in a quality ring binder.
The manual contains a full guide to C so there is no necessity for a separate textbook.

STANDARD FUNCTION LIBRARIES

Over one hundred and twenty functions are supplied as standard.
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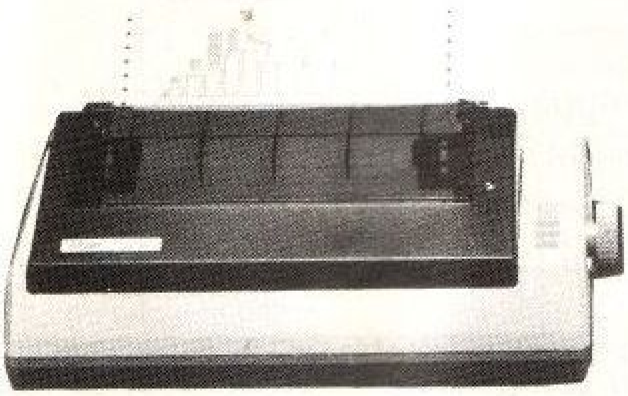
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You don't need a calculator to work out that Software Technology's Cracker Plus spreadsheet and mathematical modeller at £49 is an absolute bargain for Amstrad CPM Plus users.

Aha, but where can you get them on a 3 inch disc?

Simple, call New Star Software Ltd., specialists in Amstrad CPM Plus installations. We will supply your program custom installed for your Amstrad 3 inch system, state the model when ordering.

There's also a number of classics available for Amstrad CPM2.2: Caxton's Cardbox, Touch 'n Go and and Brainstorm for example.

Our catalogue (which is also being shipped on the issue 12 UserSoft listings Disc as an ASCII textfile) indicates availability.

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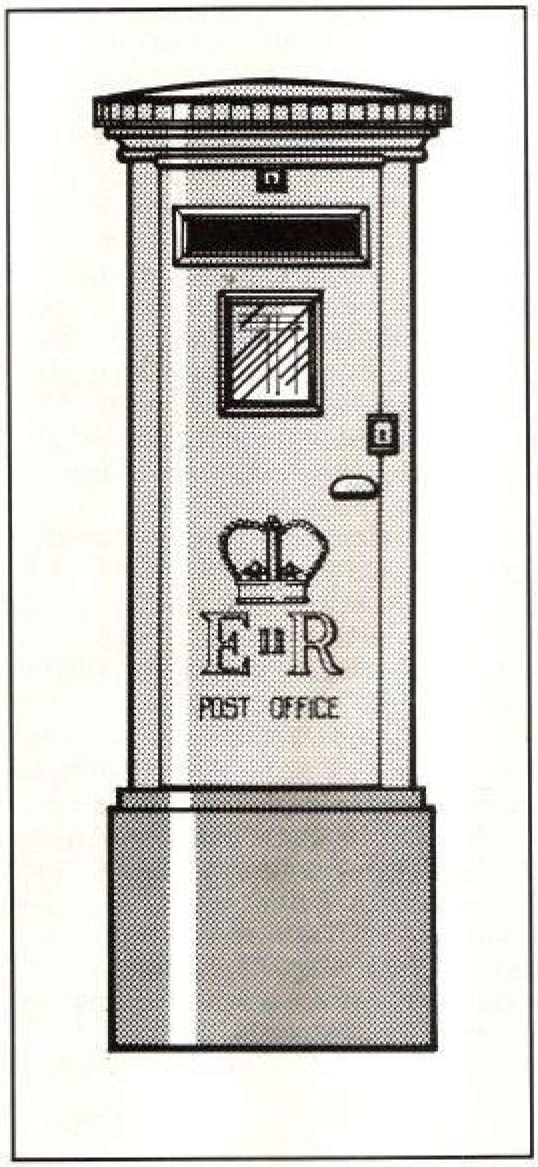
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Write to reply



The Phantom Line Feed Strikes! (again)

After some discussions with various dealers, reading magazines and some books, it would appear there are some problems with interfacing to printers other than the DMP1; namely, double line feeding. I haven't yet come across anyone who has a practical solution. However, at last, I have a simple answer to this problem.

The computer outputs to the printer both a carriage return and line feed. Amsoft's solution is a short machine code routine to intercept the line feed and convert it to a NOP or similar. This is not really a practical proposition. Most decent printers have a facility to switch on or off an automatic line feed. Obviously, if the computer outputs a line feed then the last thing you want the printer to do is add another one. On my Epson there was no effect with this DIP Switch in either position.

Further research with a multimeter and Centronics reference data highlighted the answer. The reason is that Centronics pin 14 is an Auto Line Feed connection. On permanent ground pin 14 is on the printer output. This will override any line feed DIP switch setting. The solution should now be blindingly simple and be true for most other Centronics printer namely: the removal of wire 14 from either or both ends off the interconnection cable. If you have an IDC connector then care must be used when releasing the cable clamps. A sharp knife is all that is required to separate the wires enabling removal of line 14.

N Cole
Herne Bay

ACU: Regular readers will recall that we have been through the line feed saga many times - but yet it still refuses to lie down quietly. A less drastic solution has also been proposed -cover the edge connector 'finger' at line 14 with a piece of carefully trimmed insulating tape.

Horses for courses

Derek Wray's article about Microscript in the September issue is to say the least rather unfair about the competition.

Having made do with Easi Amsword until getting Microscript, I can understand why he thinks Microscript is so good, Easi Amsword is terrible, but for £8.95 what can you expect? It is a great pity that he has not tried Tasword 464-D which is superior to Microscript in many ways.

It does, it's true, have a maximum file length of around 21K but with just one command and a list of files the whole contents of a disc can be printed in one go, stopping only to change paper if not continuous. It can also be stopped at any line in order to change a daisywheel up to six times in any print run.

The formatting is equal to that of Microscript and it is also WYSIWYG. Word wrap and right justify can be switched on or off very simply. It also has cut and paste which is done by block marking the move, copy or delete. There is a status line with useful information, something lacking in Microscript, and easy on-screen reference to the functions.

I could go on and on with comparisions but I don't think I need to except to compare the price, Microscript £49.00. Tasword 464-D £24.95. I do, by the way, have Microscript as well as Tasword but my Microscript is for sale, any offers?

B K Lee
Nuneaton

ACU: Tasword is certainly one of the best home computer word processors, yet Microscript has a number of more subtle features such as the calculator and multiple format lines that make it suitable for more complex tasks.

The World's Favourite Computer

As an air crew member on a 'favourite' airline, I often take my CPC464 computer away with me on the Eastern routes. Obviously, the colour monitor is impossible to take with me, so, through the auspices of the various hotels in which I am accommodated, I am able to utilise the room television as the monitor, the power for the computer supplied by the use of the Amstrad modulator power supply MP-1. Hours of rest time are thus well catered for.

Now for the question that no one seems to be able to answer with any degree off certainty. Do I have to worry that the ROMS in the computer/programs will be affected, if I am unable to persuade security to visually examine the computer, and the computer is placed in the airport x-ray machine? Most airport security x-ray machines have a notice stating that it is 'film safe' but other crew members are of the opinion that computers, cassette programs, disc programs, etc will be damaged by the x-rays.

If you are of the opinion, with certainty, that the x-ray machine will not cause me to commit suicide if damage does occur, I would be eternally grateful. Until I am assured all is well, I have to hand carry the computer, tapes, power supply, etc, which, on top of all my official hand luggage, leaves me exhausted by the time I arrive landside of customs.

Michael Havill
Bournemouth

ACU: X-rays will not harm your computer but the large magnets used in the machine to generate the X-rays could, after a while, damage discs and cassettes.

CPC6128

OK folks, gird your loins. We had a suspicion that the launch of the CPC6128 would create a few rumblings, so let's state the stock answer first, and let you be the judge of others' views.

1. The introduction of any new product leaves owners of the previous version feeling aggrieved. It happens with any new consumer product.

2. Amstrad are proud of their policy of not discussing a new product until it is on its way to the shops. It seems fair that they prefer not to think aloud in the way that others seem to regard as part of their marketing philosophy to establish if there is any market for a product that is as yet incomplete. Or perhaps not even being designed at all yet.

3. And this is the most inescapable point: Amstrad is in business to compete in the marketplace. If Commodore, Artari and Sinclair insist on introducing new products, then Amstrad simply must compete.

4. Since the 464 has the biggest installed user base by far, most software is written to be fully 464/664/6128 compatible.

5. Owners of Dragons should be delighted. Their machines have never been superceded.

6. Owners of most other home micros have been rather more roundly fitted up by their respective manufacturers' price cutting policies. What price a Plus 4, BBC, Spectrum, etc.?

7. Like it or not, Amstrad is still here and thriving, so Amstrad owners are assured of long term support and development of their system.

8. All this is not to say that we feel the situation could not have been handled more delicately. We imagine that many 664 owners would be grateful for an opportunity to swap their 664 keyboard for a 6128 for even as much as £200; then the 664's could perhaps be passed off at very low cost into schools, who are just beginning to get into stride with the Amstrad system.

Could we have a few realistic and creative suggestions please? And please remember that ACU is not Amstrad, but a reflection of the views of the editorial staff and the contributors.
So, bearing all that in mind, here we go ......

Some time ago I seem to recollect reading an article about the forthcoming CPC6128. This seemed to be just the thing, CP/M version 3 and enough memory to run full implementations of most business software. But now the bad news, upon further reading this was only to be available in America, with no possibility of a launch in this country. So, I think to myself, well it's either a disc drive for my rather unreliable 464 or the new 664.

A decision was made to plump for the latter, and after three trips to the dealers I finally arrived home with one that actually worked correctly. About a week after this I read in the computer press that Amstrad had been lying to the public all along, and the machine that I really wanted was after all to be launched here at a not inconsiderable price reduction over the 664. I might tell you that I am incensed by this 'Joe Public will stand anything attitude'.

And I for one will now sell my computer for whatever it will fetch and furthermore I shall never again purchase anything of Amstrad's manufacture, and I sincerely hope that many more people will do the same. If only to demonstrate that it is the customer who is more important than the shareholder.

M K Gill
Brighouse

A more sober opinion....

As a 664 owner I would natually like to see that the machines and their owners are not totally forgotten. The following are a few suggestions that could restore my confidence in Amstrad as a serious computer manufacturer:

1. More programs available on disc rather than being available on cassette with protection codes, thus reducing the computer to a cassette based system.

2. A means of converting the 664 and 464 computers to being 6128 compatible through extension RAM. If this is not possible what are the possiblities of selling the 6128 without the monitor? And what would the price be?

3. Regular lists of all available software as printed in the March issue, stating whether 464, 664, or 6128 compatible and whether available on disc or not.

The new PCW 8256 is aimed squarely at the business market but still uses 6128 technology, will this mean there will be more serious software available for the 6128 or will the price of software be aimed at the serious user rise?

Lastly, how many Amstrad owners are in a similar position to myself, ie. How many 664's were sold? Maybe there's a need for a CPC664 preservation society!

M A Armitage
Marlow

ACU: The 6128 BASIC is identical to 664 BASIC. The additional banked memory handling is carried out through disc-loaded RSXs.

Yes, we are trying to get an index of software organised, but it's so big that we'll probably end up issuing it on disc through the UserSoft route because of the rapid rate of update. This month there's the first of the major CP/M catalogues being issued in this way, indicating which software will run on CP/M2.2 and CP/M Plus.

Dead 664

In July 1984 I purchased an Amstrad CPC464 computer with colour monitor. I was very pleased and impressed with the machine and began to build up a large amount of software for it. I joined the User Club and was happy with the way Amstrad quickly made available documentation, software and add-ons.

Having decided that a disc drive would be beneficial to the system. I began saving up for one. When the CPC664 was announced earlier this year, I did a few sums and worked out that it was more economical to sell my 464 and, together with the money saved for a disc drive, buy a new 664. This I proceeded to do, but having sold my 464, rumours began about a 6128. I decided to wait until the situation clarified somewhat.

Time passed slowly without a machine and I was getting impatient. However, things seemed to become clearer. The 6128 was going to be for the US market. It wasn't likely to be launched in the UK until Spring 1986. It's price in the States implied a UK price of, perhaps, £500-£600 which would be more than I really wanted to pay.

Based on these facts, a decision was made. Five weeks ago I purchased a CPC664. It cost me nearly £450. It's a nice machine and I like it. What I don't like is the sudden news that the CPC6128 is going to be in the shops by the end of August at only £399 for the colour version. What on earth is happening? How come the 664, only 4 months old, is superceded by a more advanced but cheaper machine? It is very notable that the 464 was complemented by a more advanced and more expensive machine.

To say that I am annoyed would be an understatement. What is going to happen to the 664? Unless it is discontinued, it's price must obviously have to be considerably reduced. No software will be written specifically for it - it will all be 464/664 and possibly 6128 compatible. The machine will become a dodo. Does this herald a new marketing philosophy by Amstrad? Are they going to emulate the Sinclair Syndrome - look at them now! It is this kind of customer alienation that has caused a lot of the home computer industry's current problems.

It would be a nice gesture to appease irate 664 owners if some means could be offered to upgrade their machines to a 6128 specification. This could possibly be achieved by offering a 6128 keyboard at a very reasonable price and/or trade-in as I understand the monitors would be compatible.

G Winks
Nottingham

ACU: The upgrade memory cannot be fitted easily. It is not a simple matter, and in the hands of the average fitter, such a kit would result in more dead 664s than live 128s.

Outraged of Cheltenham, (well, nearly...)

Leafing through the September issue of your Amstrad magazine, I couldn't help but notice a whimpering little letter from that lorry-driver chappy Baldwin. To be honest, that's a damned insult to all lorry drivers, my wife happens to be an ex Field Gal and drove a Red Cross lorry. Now admittedly, she's no intellectual (although she lays a good row of bricks) but compared to him she's a ruddy Einstein. I just happen to know the complaining little nurd - I shamefully share the same household with him!

It's not even his damned computer, sir; at least not until he's paid me the money I loaned him to buy everything with! Do you know he told me he was expecting a large Giro and scrounged the cash from me on the strength of it -never again! The man's an out and out, complete and utter scoundrel. Not only that, he keeps me awake to all hours every night with the rattle of keys, the chatter of a printer, silly little tinny tunes (played through my ruddy hi-fi unit nonetheless) and worst of all, shouted expletives and crashing noises as software gets thrown against the walls.

It would appear that he is getting a lot of trouble with a program called 'Classic Adventure'.

He complains of snakes and birds and how every time he gets past the 'slimy reptile' the program crashes (just as he's about to make a note of the list of goodies that are displayed) - had a go myself and for once in his miserable life he's actually telling the truth, bit of a bad show on the part of Amsoft Software House, I think. On the promise of yet another Giro, I decided to help the silly little man out. Most of his problems with your programs turned out to be stupid typing errors and a complete misunderstanding about saving files. Quite honestly he should stick to smashing bricks for a living. Now I'm being kept awake by insane cackles of laughter as he plays games like Frogger etc., (a cosmetic improvement to Beat the Clock would be ...2410 PEN 2: PRINT "D";PEN 1: PRINT "own").

Do you know the lazy cad is now receiving threatening letters and phone calls from his employers saying if he doesn't turn up soon they'll give his job to an even bigger moron than he is? (Mind you, where they pick them up from I'm sure I don't know.) He's spinning this yarn at present as to how he sent away to the User Club (I showed the silly ass his Membership number) for a Firmware Specification and, according to him, they sent him the Concise Basic Specification (which he already has) Soft 157 and not Soft 158. I explained to the idiot that he had obviously made a mistake when he ordered it - not only can't he type, neither can he write with any degree of legibility.

Anyway do you think there is anything you could do about it, as much as I dislike the fellow I have to be completely honest and say that it is in pristine condition and is completely unused. It appears that now he owns a disc drive and a printer. It was an expensive mistake to make and considering his Giros do not seem to be coming through 'regular like' anymore. What the little whinger needs is a long sharp shock treatment, (bring back the cat). If I'd had him under my command in India, good sir, I'd have made a man of him.

As for myself, I must congratulate you on a splendid magazine (even if the damned staples do keep falling out) and would ask you to print a little thankyou to J A Campbell (Campbell Systems) for his kind letter to me and for turning out such an excellent piece of software as 'Masterfile'. It deserves an award (mind you, I'm having tremendous problems formatting the print outs). Have you any plans for some serious software listings such as assemblers, monitors, disassemblers etc. - I promise to keep them away from him downstairs?

Anon.

P.S. (At the moment, I'm running an NEC-8023BE-C Printer on which I have problems printing 'hash' and 'pound' signs at the same time (if I fiddle the wiring of the centronics, I can get one or 't'other - but not both) - any ideas? Soon, I'm going to be running either an Epson RX or FX 80 - will I get the same problems do you know? How's about if I use the printer in the parallel mode (with an interface of course)?

ACU: A number of the staff took quite a while to realise that their legs were being pulled by Our Correspondent above. God help us if he bought a CPC664 on August 19th.......

ACU





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Reviewed by Simon Williams

Pascal 4T/D, Amsoft/HiSoft, 180 High Street North, Dunstable, Beds. LU6 1AT, 0582 696421, £34.95 Tape, £39.95 Disc The Hisoft Guide to Pascal, Amsoft, £14.95



Pascal is to BASIC what the Amstrad micros are to the Sinclair Spectrum -neater, smarter, more complete but with, as yet, fewer users. Both languages were originally intended as 'models' for teaching computing, but each adopts a completely different design philosophy, which can make it hard to swap from one to the other. This is a shame, as Pascal in general (and HiSoft 4T/D in particular) is a very powerful, compiled language, which runs many times faster than even Locomotive BASIC.

BASIC was designed to make computing as easy as possible to learn, by allowing the programmer to do things exactly as he/she wanted. Pascal, on the other hand, encourages the novice programmer to follow 'proper' programming constraints by imposing strict syntax and structure checks on the programs that are compiled. This can be a bit irritating at first, as when you recompile a ten line program for the eighth time because you've forgotten yet another semi-colon.

After a while, though, you begin to appreciate what you can do with the language. As the months go by, you become more and more thankful for the Pascal philosophy which forced you to set your program out in a readable way. When you come to revise an old Pascal program you can see what you did in the first place, and can usually graft on the necessary extension without having to rewrite the program from scratch.

HiSoft Pascal 4T/D ('T' stands for the Tape and 'D' for the Disc versions) is the only version of the language available under AMSDOS, although there are several versions (including HiSoft's Pascal 80) which run under CP/M. It is supplied as a cassette or disc, together with a manual.

The manual is very much a reference guide. It makes no attempt to teach you the language, and for this you have to buy a tutorial book, or the 'tape and text' approach of HiSoft's own 'Guide to Pascal'. The combined cost of the language and the tutorial package is quite high, and it's a shame the decision was not taken to bundle the two together as a complete package, at a lower cost.

That said, the information supplied is very succinct and complete. The reference guide, which runs to nearly 100 pages, contains instructions in the use of the compiler, syntax diagrams of the complete HiSoft implementation, descriptions of the pre-defined identifiers, details of the line editor and a description of the turtle graphics supplied with the package.

Appendices describing compiler and run-time error messages, offer some example programs and provide a library of functions and procedures. This library contains routines to mimic most of the useful features available through Locomotive BASIC, and several which are only available via calls to the operating system. This is an extremely valuable extension to the language in its own right.

The tape and text tutorial works well, providing plenty of sample Pascal source code and progressing steadily through from first principles. I felt a couple of topics were out of their best order, but generally found the text very useful. It is labelled as 'part 1', and among other things, there is no

coverage of graphics or records within it, so I imagine there will be a second volume. I hope the price won't be doubled as well.

HiSoft Pascal is a fast implementation of the language specified in the original 'Pascal Report' produced by Jensen and Wirth. Nicklaus Wirth (pronounced 'virt' by his friends) was the originator of Pascal, so you can gather that HiSoft's version is close to what was originally intended for the language. The extensions added to make use of the Amstrad's features are provided as pre-defined functions or in the library routines, so the basic language can remain true to the Jensen/Wirth standard. The only features missing from this implementation are variant RECORDs, the use of FUNCTIONSs and PROCEDUREs as parameters and the lack of same filing routines.

Turtle graphics are more often associated with the language Logo than with Pascal, and provide an easy way of constructing complex geometric figures on the screen. In Logo, which is an interpreted language and subsequently quite slow in operation, these drawings take a while to create. In Pascal, though, they run very quickly and can be used to great effect in many different applications. The inclusion of the turtle graphics package in HiSoft Pascal is a considerable bonus.

HiSoft Pascal allows you easy access to the registers of the Z80 processor, by providing a series of pre-defined Pascal variables which can be used to load the registers before an operating system call, and to read the results from them after the call has been made.

The line editor provided with the package is very reminiscent of the Locomotive BASIC editor with which most Amstrad users should be familiar. You can insert and delete lines in the same way as with BASIC, and the editor will renumber them for you on request. You can use the copy cursor to revise lines of program, or type 'E n', where n is the required line number, and edit the line directly. This, again should raise no eyebrows amongst Amstrad users.

All HiSoft editor commands are called by a single letter, and as well as the obvious 'E' for edit, 'I' for insert, 'D' for delete and 'L' for list, there are a number of extra features not available to the Locomotive BASIC programmer. These include 'M' to move a block of code (the program will automatically be renumbered if the 'moved' section is to overwrite existing lines), and 'F' to find a string within the text of a program, and replace it with another, if specified. There are also functions to save and load a program and to print it out.

The line numbers attached to the program, which is usually called the 'source' file, are purely for your convenience. Pascal doesn't include GOSUB or GOTO statements with line numbers as their operands, and so has no need of the numbers. They are useful for reference, however. When you compile the program, the line numbers are ignored by the compiler.

Before you can run a HiSoft Pascal program, you have to compile it into a machine-code 'object' file. This is done by typing 'C' for compile. The program will then be listed out, line by line, as it's compiled; and any errors that the compiler detects will be signalled with an arrow pointing to the offending area of the line, and an error number telling you what the trouble is. The number has to be translated into a corresponding message via one of the appendices in the reference manual, and you can then re-enter the editor to correct the mistake.

In compiled languages a single error, particularly if in the syntax of a line, can cause a number of 'spurious' errors to be generated further on, so HiSoft make their compiler stop at each error, to give you the chance to edit the program before proceeding.

The HiSoft compiler offers a number of options, so you can tailor the process to your own needs. Most of these options cover various 'checks' that the compiler may make, including arithmetic overflow and array indices within range. You can also select the inclusion of other Pascal source files from tape or disc. This means you can build up a program from predefined sections, stored as separate text files.

When you eventually get your program to compile successfully, you are prompted with 'Run?', which is one of the nicest prompts you'll see while developing a Pascal program. If you answer 'Y', the program runs and you can begin to see the extra speed Pascal produces.

As an example of how easy it is to use HiSoft Pascal on the Amstrad machines, look at the program listing in Fig. 1. This shows a short Pascal program which will calculate and display a month's calendar for any month between January 1901 and December 1999. It makes use of two library routines, to set the cursor (equivalent to BASIC's 'LOCATE' command) and define a text window (equivalent to 'WINDOW'), and the rest is fairly straight forward Pascal.

Fig 1-EXAMPLE PROGRAM IN HISOFT PASAL

```
 10 PROGRAM calendar;
 20
 30 VAR m:ARRAY [1..12] OF INTEGER;
 40     month,year,count,start:INTEGER;
 50
 60
 70 PROCEDURE setcursor(c,r:INTEGER);
 80 BEGIN
 90   rh:=CHR(c);
100   rl:=CHR(r);
110   USER(#bb75)
120 END;
130
140 PROCEDURE winenable(col1,col2,row1,row2:INTEGER);
150 BEGIN
160   rh:=CHR(col1); rd:=CHR(col2);
170   rl:=CHR(row1); re:=CHR(row2);
180   USER(#bb66)
190 END;
200
210
220 BEGIN
230   m[1]:=31; m[2]:=28; m[3]:=31; m[4]:=30;
240   m[5]:=31; m[6]:=30; m[7]:=31; m[8]:=31;
250   m[9]:=30; m[10]:=31; m[11]:=30; m[12]:=31;
260   WRITELN(CHR(12));
270   REPEAT
280     setcursor(1,23);
290     WRITE('Enter month (1 to 12): ');
300     READ(month);
310     WRITE('Enter year (1901-1999): ');
320     READ(year);
330     WRITELN(CHR(12));
340     start:=6-(2000-year+(2000-year)DIV 4)MOD 7;
350     count:=1;
360     WHILE count<month DO
370     BEGIN
380       start:=start+m[count];
390       count:=count+1;
400     END;
410     IF (year MOD 4=0) AND (month>2) THEN start:=start+1;
420     start:=start MOD 7;
430     winenable(30,50,8,16);
```

```
      WRITELN('  S  M  T  W  T  F  S');
      setcursor(start*3+2,3);
      FOR count:=1 TO m[month] DO
      BEGIN
        IF count<10 THEN WRITE(' ');
        WRITE(count);
      END;
      winenable(1,80,1,25);
    UNTIL FALSE;
END.
```

All HiSoft Pascal keywords have to be entered in upper case; the compiler will not convert them for you as the Locomotive interpreter does.

A brief run-through of the program may help to throw off some of your worries about learning a new language. Apart from remembering that variables and procedures must be specifically declared before they are referred to in the program, and that all individual statements must end with a semi-colon, Pascal's not that difficult to get used to.

The first line of any Pascal program must state 'PROGRAM', and give it a name. This will usually be followed by the definition of the 'global' variables used within it. These are defined at the start, so the compiler can make space for them in memory, and doesn't have to worry about new ones being introduced later on (except for 'local' variables used in FUNCTIONs and PROCEDUREs). The types of the variables are also declared, and in this program they are all INTEGERs

Two library PROCEDUREs are the only ones used in this program. A PROCEDURE is similar to a BASIC subroutine, except that it's called by name and can have values ('parameters') passed to it from the program that calls it. The parameters are enclosed in brackets, after the name of the PROCEDURE, and, in this case, also have their types defined as INTEGER. A FUNCTION is much like a PROCEDURE, except that a value is returned to the program that calls it, again like a BASIC 'FN' call.

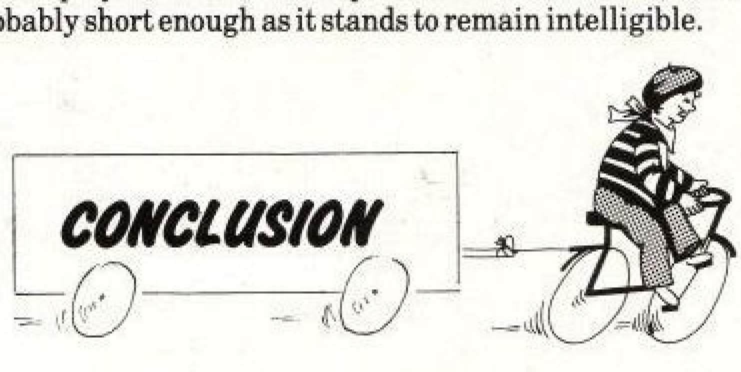
The statements which make up a Pascal PROCEDURE, FUNCTION or the main body of the program are enclosed between a 'BEGIN' and 'END' statement. As well as dividing up the program neatly, they allow multi-line 'IF....THEN....ELSE' clauses. Pascal also has the 'FOR...TO...DO', 'WHILE...DO' and 'REPEAT...UNTIL' loops. The 'REPEAT...UNTIL' clause is like a 'WHILE...DO' clause, except that the conditional test is made at the end of the loop, rather than the beginning.

The program starts by filling the array 'm', which was defined at the start, with the number of days in each month of the year. The screen is then cleared and the month and year are entered by the user of the program. The program as listed includes no error checking on these entries.

The day of the week of the first day of the required month and year is calculated in two stages. To start, the day of the week of the first of January is worked out, and then the lengths of each month, held in array 'm', are added to it to arrive at the first day of the correct month and year.

The calendar is displayed by defining a text window just wide enough for seven numbers and displaying the full month, starting on the right day.

Each computation is virtually instantaneous, taking only as long as is needed to display the answer. The program itself is concise and easy to read because of the imposed structure and syntax of Pascal. It could have been broken down into smaller units by separating the keyboard entry, calculation and display functions into separate PROCEDURE's, but is probably short enough as it stands to remain intelligible.



HiSoft Pascal 4T/D is a fast efficient implementation of Pascal which compiles to Z80 object code. This code may then be used on other machines without the compiler installed, providing the opportunity for commercial sales of programs written with it.

The speed of HiSoft Pascal, in comparison with BASIC, makes it a very attractive language in which to write, particularly since many of the commands and structures are quite similar, at least in appearance, to their BASIC counterparts.

The addition of Amstrad-specific procedures, easy access to the operating system and the inclusion of the turtle graphics package make this version of Pascal very attractive to anyone considering a second language to run on their micro. It can be thoroughly recommended.



ACU

GALLUP

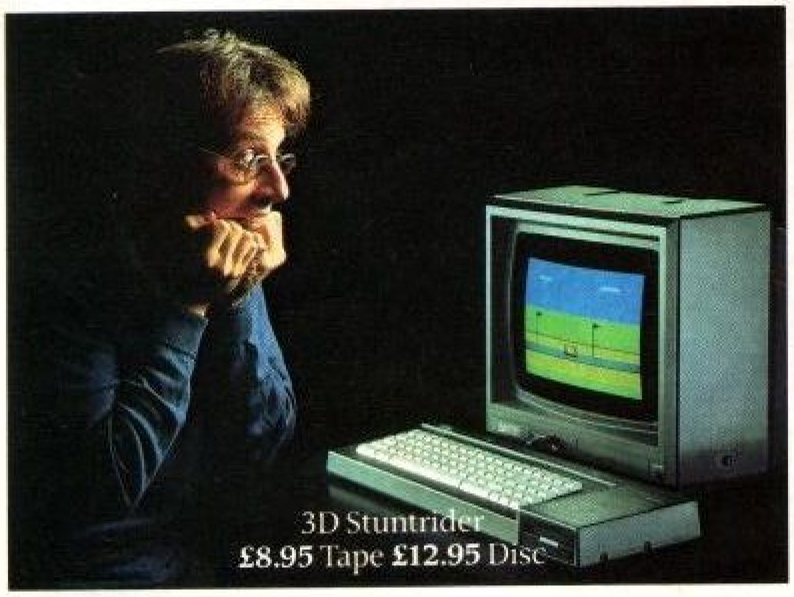


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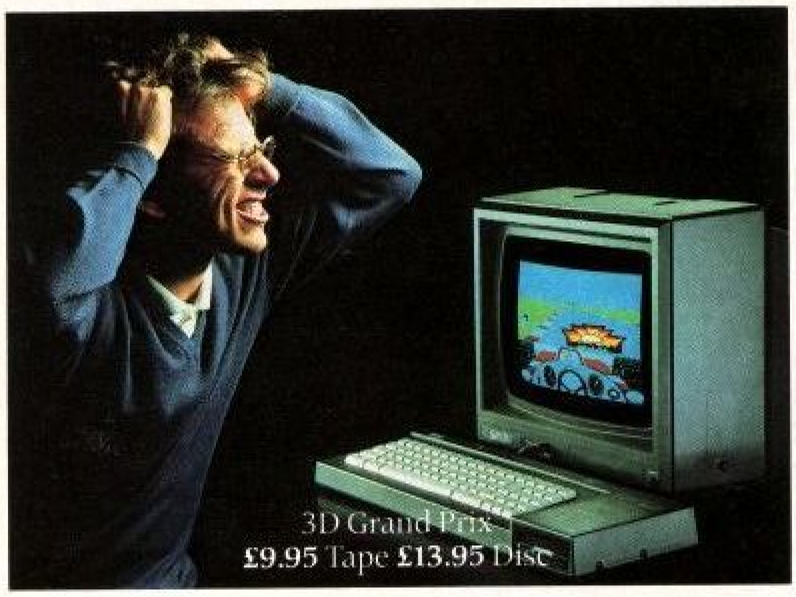
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1	WAY OF THE EXPLODING FIST Melbourne House	-	◀▶	???	1	100
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3	FINDERS KEEPERS Master Tronic	5	▲	664	1	51
4	CHILLER Master Tronic	6	▲	664	1	47
5	NON TERRAQUEOUS Master Tronic	18	▲	664	1	41
6	SCRABBLE Leisure Genius	-		664	NE	32
7	BEACH HEAD US Gold	2	▼	A 664 D	3	31
8	RED ARROWS Database	15	▲	???	1	30
9	LOCOMOTION Master Tronic	-		???	NE	28
10	BRIAN JACK'S SUPERSTAR CHALLENGE Martech	-		???	NE	24
11	STARION Melbourne House	-		664	NE	22
12	ALIEN 8 Ultimate	3	▼	664	3	22
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15	A VIEW TO A KILL Domark	-		664	NE	18
16	DALEY THOMPSON'S DECATHLON Ocean	9	▼		4	17
17	GRAND PRIX RALLY II Amsoft	-		A 664 D	NE	14
18	FIGHTER PILOT Digital Intergration	-		664	NE	13
19	COMBAT LYNX Durrell	11	▼	664	5	12
20	SHORT'S FUSE BT Firebird	14	▼	664	1	12

D Available on Disc — 664 CPC 664/6128 Compatible — A Available from Amsoft — ??? Untested

SOFTWARE CHART

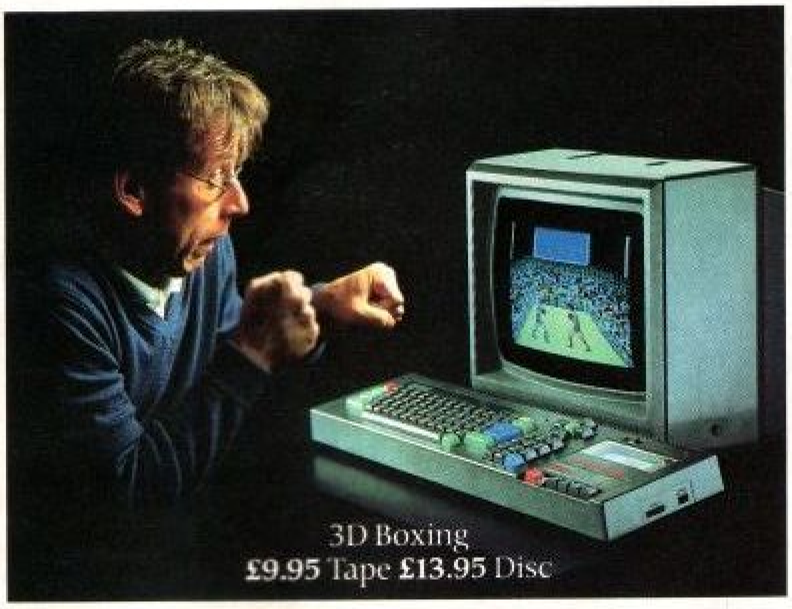


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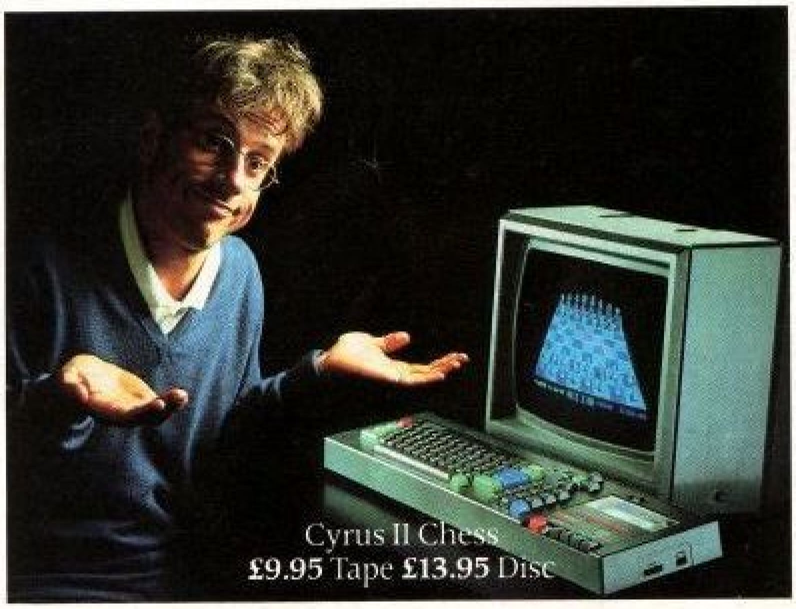


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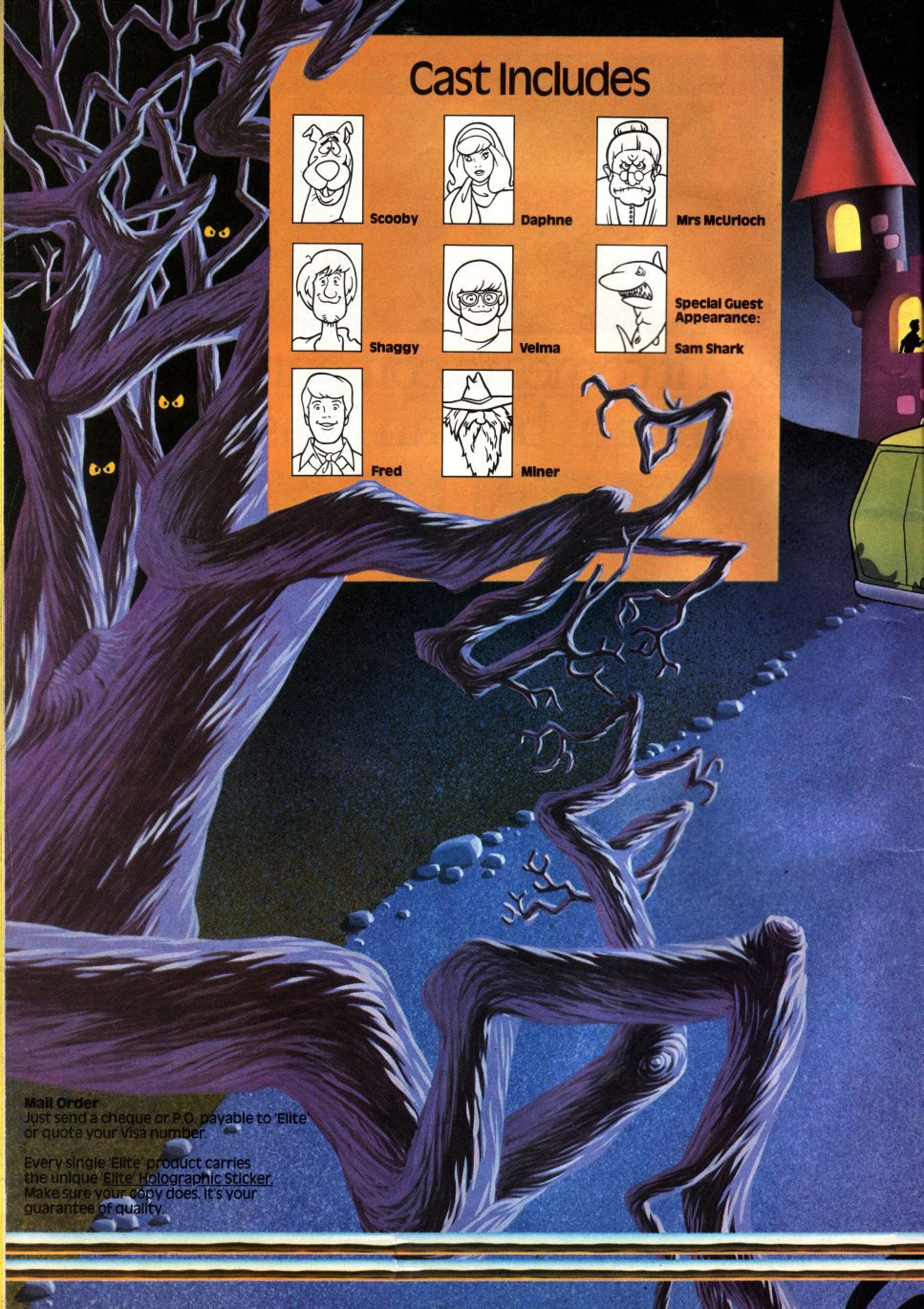
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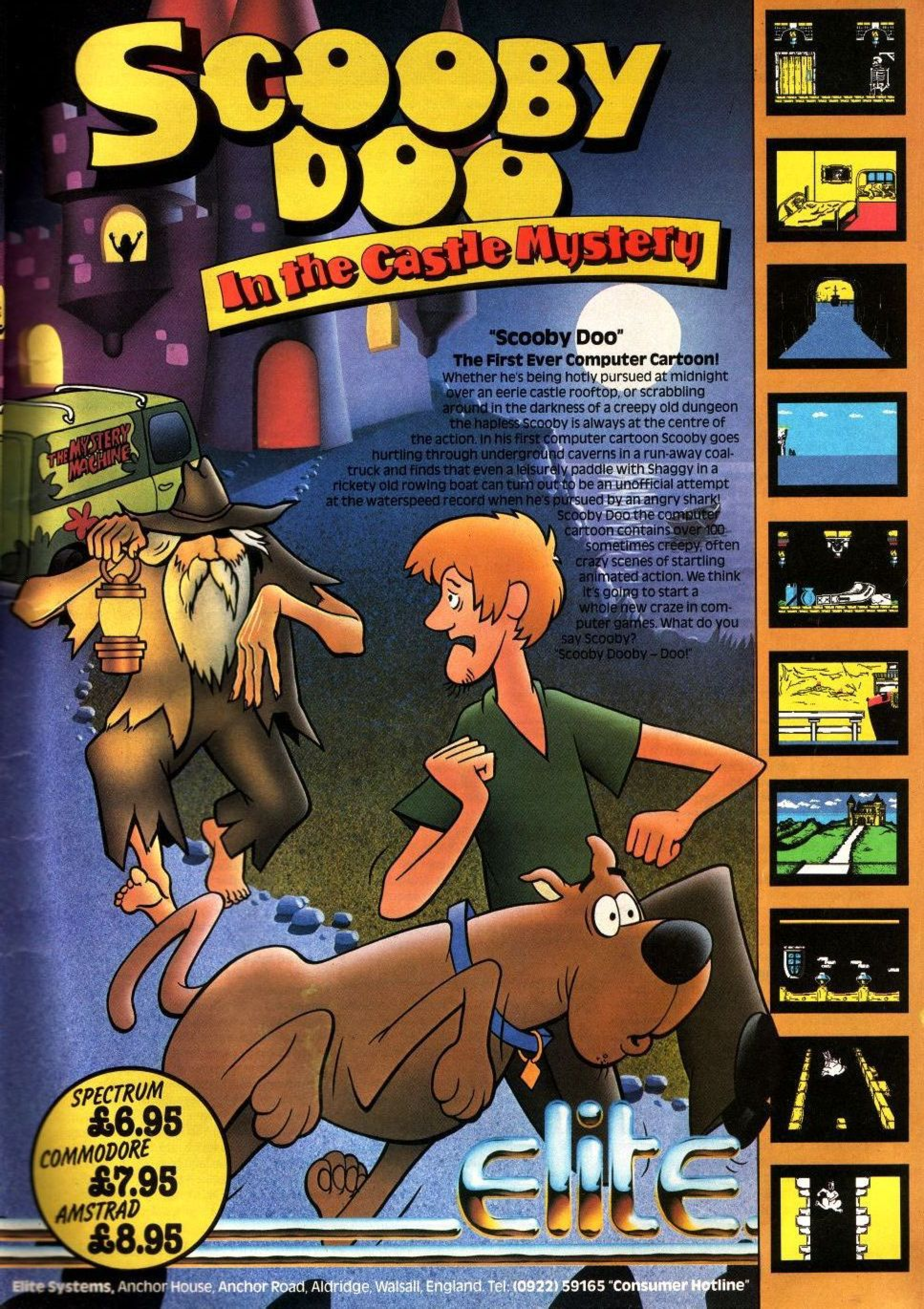
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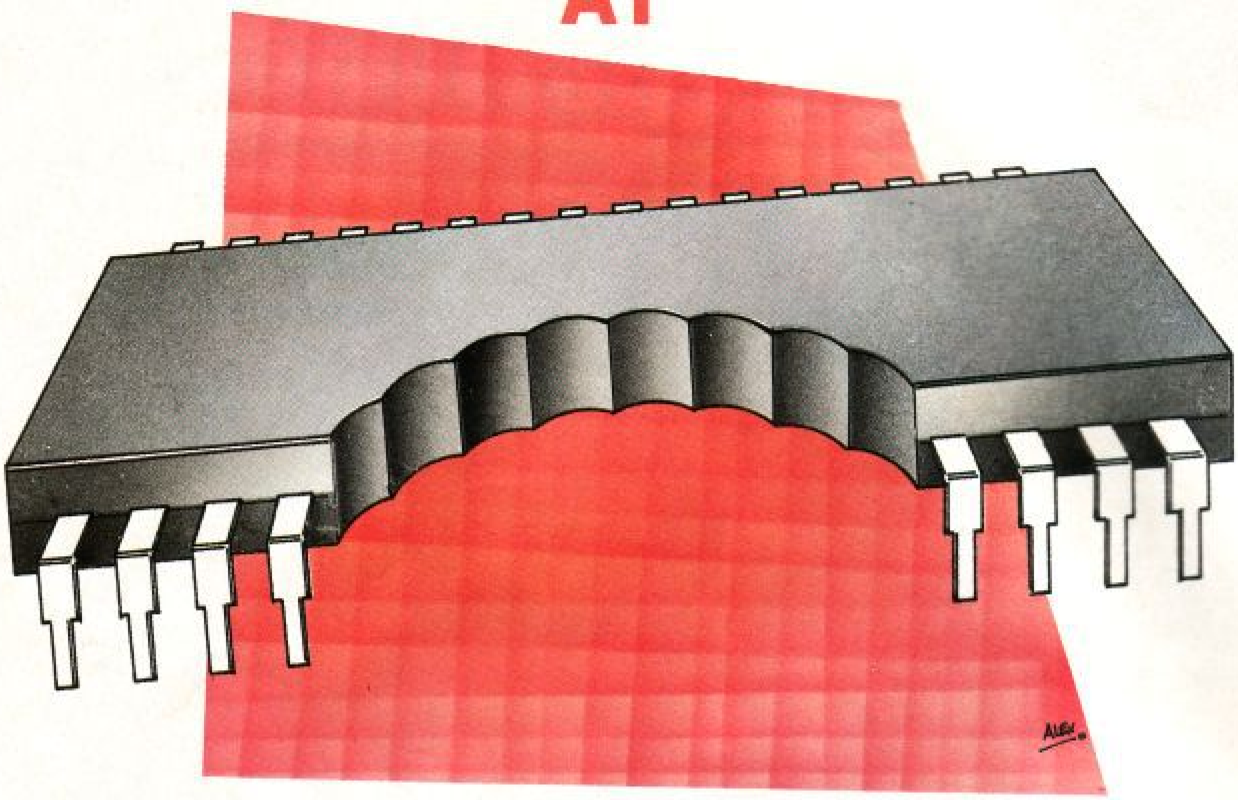
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FIRST BYTE AT MACHINE CODE



Part One By Ben Lewis

This is the first of four articles in which I hope to introduce the absolute beginner (and I mean absolute beginner) to the world of machine code programming. It should be stressed though that a reasonably good knowledge of BASIC is required to get the most out of it. All the examples given should work perfectly well on the 464 and 664 but first, if you haven't read Appendix II of the 464 manual, or Chapter 8 page 11 onwards from the 664 manual then do so now. These sections explain what a byte, bit and Hex are and then I won't feel inhibited by using these terms.

Now the big question itself. What exactly is Machine Code? It is a language, not too much unlike BASIC (and I will make comparisons where necessary to clarify examples), but on a much lower level. What I mean by this is that the majority of instructions will do far less than any BASIC command, but when combined together to form a program, are capable of doing a hell of a lot more, and at a much greater speed. You have all used machine code (m/c) in all your programs, but probably without even knowing it. When a BASIC program is run, each instruction is first turned into m/c before being used. This is necessary and takes some time (hence BASIC is slower). The computer doesn't know what you mean by 'PLOT 10,10', but equally the human usually doesn't know how to tell the computer any other way, and so the information is first interpreted and then used. It is interpreted by translating the instruction into a series of numbers, and then sending them to the Central Processing Unit (the Z80 in this case), which is the heart of the computer. All this unit understands is numbers, and that is all m/c is - numbers. A particular sequence of numbers may mean one thing, another sequence may be interpreted by the Z80 in another way.

Mnemonics and Opcodes

These represent a particular series of numbers, and it is with opcodes and mnemonics that one usually writes m/c in. Like BASIC, the computer does not understand the opcodes and so all these have to be translated into numbers. Unlike BASIC, the whole of this translation, or COMPILING as it is known, is undertaken before the program is run, and is performed by an ASSEMBLER. The assembler translates the opcodes, known as the SOURCE CODE, into what is known as the OBJECT CODE. So, for example, a BASIC program to count up to ten may be in the region of 30 bytes long, and perhaps hundreds of bytes will be processed by the Z80, but one can combine m/c instructions together to count up to ten, and this will only be 6 bytes long, and only 33 bytes are processed by the computer. So another advantage m/c has over BASIC is its compactness.

But how do we put m/c into the computer, and more importantly perhaps, how do we run it? Does the computer provide us with a means of entering source code, compiling it, and running it? It is possible to enter object code straight into the computer by means of a small BASIC program and it is also possible to run it (BASIC provides us with the CALL command to do this.) Unfortunately, it is not possible to enter source code and compile it without the use of some sophisticated software, an assembler with editor (used to enter source code), and

without this tool, hand-assembly is the only way to input the program. This involves a lot of time and effort and is prone to mistakes. Usually, any mistake in the program will result in the computer CRASHING.

Crashing is what happens when the Z80 receives some bytes it just can't understand, perhaps due to a misplaced opcode, or a drastic mistake in the programming or compiling. Crashing does absolutely no harm to the computer hardware, but the Z80 becomes confused and it will either seize up completely or reset the machine, and the program is lost forever. If there is a mistake in a BASIC program, it usually will not work. If there is a mistake in a m/c program, it will usually crash. So you can either rush out now and buy an assembler, which I recommend if you are serious about learning m/c, or you can type in the program shown in Figure 1 (don't forget to save it) which will allow you to enter, via BASIC, object code in the form of HEX bytes (hex-code). This type of program is called a hex loader.

Making Space

Before we dive straight into the program, I still have to explain some of the commands used in the program, and how to use the loader. The MEMORY command, is used to reserve some memory to store m/c. The RAM can basically be divided into four sections. The first few bytes are reserved for some system variables, and shouldn't be altered by the inexperienced, since the computer relies on these values to remember exactly what it is doing.

The next section, which is usually about 40K long, is called the memory pool, and this is where m/c can be written. There then follows another section of system variables, and finally the screen memory, which starts at location &C000 and is thus 16K long. On switching on the computer, the memory pool is divided into 2 sections, separated at an address known as HIMEM. The area above himem can be used to store m/c without it ever being erased accidentally by the computer, as long as it doesn't run into the second section of system variables. The area below is reserved for BASIC programming, and is at first much greater than the area above himem. The MEMORY command is used to alter the value of himem, and thus to reserve a lot more memory for m/c You will be losing memory for the use of BASIC programs. This does not usually matter, since you are now writing some of the program in m/c. Reset the computer now, and type in 'PRINT himem'. You should be greeted with a number in the order of 43000. It may be greater or less than this depending on your machine and what you have plugged in the back. Now type in 'MEMORY 30000:PRINT himem'. The value returned should be 30000, and you have now reserved memory to write m/c into, above and beyond the address 30000. This is what the first part of the hex-loader is for, and it will ask you to enter a suitable value for himem. For all my examples I have chosen &7000 as a suitable value, but you can choose differently when you begin creating your own concoctions.

With all that behind us, I think it's about time you learnt your first m/c instruction. A m/c program, when run from BASIC, is a subroutine, very much like the GOSUB-RETURN structure you should be familiar with. But instead of saying GOSUB a line number, you are required to CALL an address, where the address is the position in memory of the byte you wish to start the m/c executing from (not necessarily the beginning of the m/c block). Just like a RETURN command from a BASIC subroutine, you need to have some way of returning control back to BASIC from a m/c subroutine, and this has to be a m/c instruction. The opcode to do this RET.

```
7000 C9 RET returntoBASIC
```

Above is a m/c program. It doesn't look like much, and that is because it doesn't really do anything, but it does demonstrate the RET instruction. The first thing you will notice is that the code is written in four distinctive columns, and that is the way it should be written. The first column is the address of where the start of the hex-code for each individual instruction is to be stored. This allows us to identify an instruction with an address. The second column is the hex-code. Each row shows up to four bytes, which is the maximum number needed to identify (to the Z80) one particular instruction. The third column is the opcode, and the fourth, which is not obligatory, is a note explaining what the code is doing. Unlike BASIC, someone else's m/c can be difficult to interpret, and often the programmer leaves the note to remind himself what is the exact purpose of a set of instructions.

Figure 1

```
5 MODE 1
15 INPUT "SET HIMEM TO WHICH VALUE (HEX)";HIM$
25 PRINT
35 INPUT"LOAD THE DATA TO WHICH START ADDRESS    (HEX)";ST$
45 PRINT
55 MEMORY VAL("&"+HIM$):ADDR=VAL("&"+ST$):START=ADDR
65 PRINT"INPUT THE DATA IN HEX,"
75 PRINT"   INPUT '.' WHEN FINISHED":PRINT
85 INPUT S$
95 IF S$="." THEN GOTO 135
105 R$=LEFT$(S$,2):S$=MID$(S$,3)
115 POKE ADDR,VAL("&"+R$):ADDR=ADDR+1
125 IF LEN(S$)>0 THEN GOTO 95 ELSE GOTO 85
135 PRINT:PRINT"M/C IS";ADDR-START;"BYTES LONG"
145 PRINT"AND STARTS AT";START:PRINT:PRINT:PRINT
150 'END.
```

Load the program from figure 1 and run it. You will be greeted with a prompt and answer it with 7000, the value to set himem to. Then enter 7010 as the start address of the m/c program you are going to enter. Enter the program above as 'C9.' and press return (the full stop is to instruct the hex-loader that you have finished inputing the program). You are now ready to call the subroutine. To do this enter the BASIC command 'CALL &7010'. Control now jumps to the code located at &7010 and the Z80 comes across the first instruction to execute, RET. This instructs the Z80 to return control to BASIC and continue from where it left off - just like a RETURN in BASIC. So, on running the program, you are immediately greeted with a Ready prompt. You must always end a m/c routine with a RET instruction otherwise the computer will crash. Unlike BASIC, the computer doesn't know where to end the program if you omit the RET. It will then proceed to plough on through all the addresses past the end of the program, trying to execute instructions that do not exist, and this will most definitely end with a crash. (It's not strictly true that a RET is needed to end a m/c subroutine but for the time being RET should be used).

Register

Before we learn any more instructions, it is necessary to take a short break and learn about REGISTERS. Registers are very similar to variables but have restrictions as follows:

1) There are only a set number of registers, each with it's own name.
2) The registers can only store an integer number in the range 0 to 255 (or -128 to 127 depending on how you interpret the value).
3) There are restrictions to the way you can interact the registers. You must use set instructions eg. there is no way of adding the B register to the C register directly.

There are seven registers most commonly used for m/c, these being A, B, C, D, E, H and L. The most important register is A, which has been given the special name ACCUMULATOR, since this is where most of the answers accumulate. The other

registers don't really have a name, but some people refer to H and L as HIGH and LOW: the reason for this will not be apparent straight away but will be explained in due course.

Now consider the BASIC instruction LET A=&D3. This can be emulated in m/c using the instruction LOAD (written LD for short). When one says 'Load A with D3', they mean let A take on the value of D3, but load has a much more general meaning, as you may have gathered from its use in the cassette handling system and in the term 'hex-loader'. When bytes are loaded, they are copied from one place to another, and in fact if you examine any m/c instruction, this is basically all that happens, and that is all a computer is really capable of. Anyway, Figure 2 shows the LD opcodes together with the hex-code and the BASIC equivalent to clarify the meaning. The general form of this instruction is

```
LD r,n
```

where r stands for one of the registers (A, B, C, ...) and n is a number in the range 0 to 255. So, for example, LET D=&2E would become LD D,2E as an opcode, and the hex-code would be 162E, which, as you can see, is a 2-byte instruction.

If it were only possible to load a register with a constant, we would be a bit stuck. So we can also load a register with the contents of another register ie. copy the contents of one register into another. The general way of writing this instruction is

```
LD r,r_
```

where r and r' are any of the registers and is the m/c equivalent of LET r=r'. Figure 3 shows all the hex-codes for all the combinations of r and r', and you will notice that this is a one-byte instruction. So for example, the code for LD A,H is 7C and for LD H,A is 67.

Here is a short m/c program. Can you figure out what it is doing?

```
7000   1626    LD D,&26
7002    3E3B    LD A,&3B
7004    47      LD B,A
7005    7A      LD A,D
7006    50      LD D,B
7007    C9      RET
```

First of all, the register D takes on the value 26 and A the value 3B. That is all straightforward, but what about the second half of the program? What has happened is that A ends up with the value of D and D the value of A. This requires the use of a third register, the B register, to temporarily hold the value of A while A is being loaded with the value of D. Such a register is sometimes called a dummy variable.

Figure 2

Hex-codes for LD r,n

HEX	OPCODE	BASIC
3E	LD A,	LET A=
06	LD B,	LET B=
0E	LD C,	LET C=
16	LD D,	LET D=
1E	LD E,	LET E=
26	LD H,	LET H=
2E	LD L,	LET L=

Figure 3

Hex-codes for LD r,r'

\r' r\	A	B	C	D	E	H	L
A	7F	78	79	7A	7B	7C	7D
B	47	40	41	42	43	44	45
C	4F	48	49	4A	4B	4C	4D
D	57	50	51	52	53	54	55
E	5F	58	59	5A	5B	5C	5D
H	67	60	61	62	63	64	65
L	6F	68	69	6A	6B	6C	6D

I shall end this month by having a quick look at the CALL command (the m/c instruction not the BASIC one). In m/c, we can have subroutines as much as from BASIC, and the command to do this is CALL.

```
CD CALL nn
```

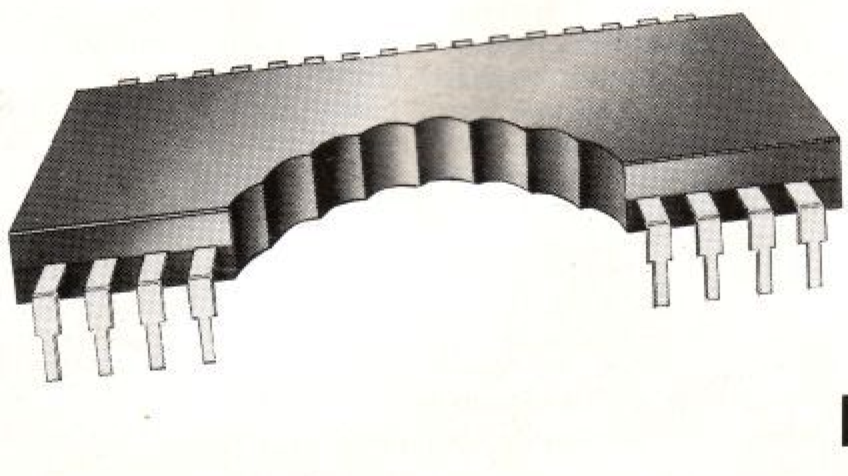
It is a three-byte instruction, always beginning with CD, and followed by two bytes representing the address at which the subroutine is to start: nn refers to the two bytes which make up the address, which is a 16-bit number. A 16-bit number consists of two 8-bit bytes (a word), for example &BB and &5A. We call the first byte the HIGH byte, since it has &100 (256) times the value it would have if it were on its own. The second byte, &5A, is the LOW byte since it has the same value whether it were on its own or not. So &BB and &5A together become &5A + &BB00 (&100 * &BB), which is written BB5A, ie. the high byte before the low byte. CALL has the same meaning as the BASIC counterpart, ie. start executing m/c from address nn. The way we end a m/c subroutine is by using the RET instruction. This should be familiar to you, because it is the very same RET we have been using to get back to BASIC at the end of a program. The two CALL commands work in a very similar way, and so the same RET command is used to end both.

Look at the following program:

```
7000    3E41      LD A, &41
7002    CD5ABB    CALL &BB5A
7005    3E79      LD A, &43
7007    CD5ABB    CALL &BB5A
700A    3E65      LD A, &55
700C    CD5ABB    CALL &BB5A
700F    C9        RET
```

Do you notice anything strange about it? If not, here's a clue - look at the CALL instructions. If you noticed that the two bytes in the hex-code making up the address of the start of the m/c subroutine were transposed, well done! For this is the way we code an address, or in fact any two bytes referring to a 16-bit number. The low byte is ALWAYS put before the high byte in the hex-code, despite the fact that it is the other way around in the opcodes. Got it? Load the program using the hex-loader and run it. Can you see how it works?

Before next month, try to write and run a m/c program which prints out your whole name, and then moves the cursor down a couple of lines before finishing (hint - the CALL instruction here executes a subroutine, already stored in the computers ROM, which will print one character - how does it know which character to print?).



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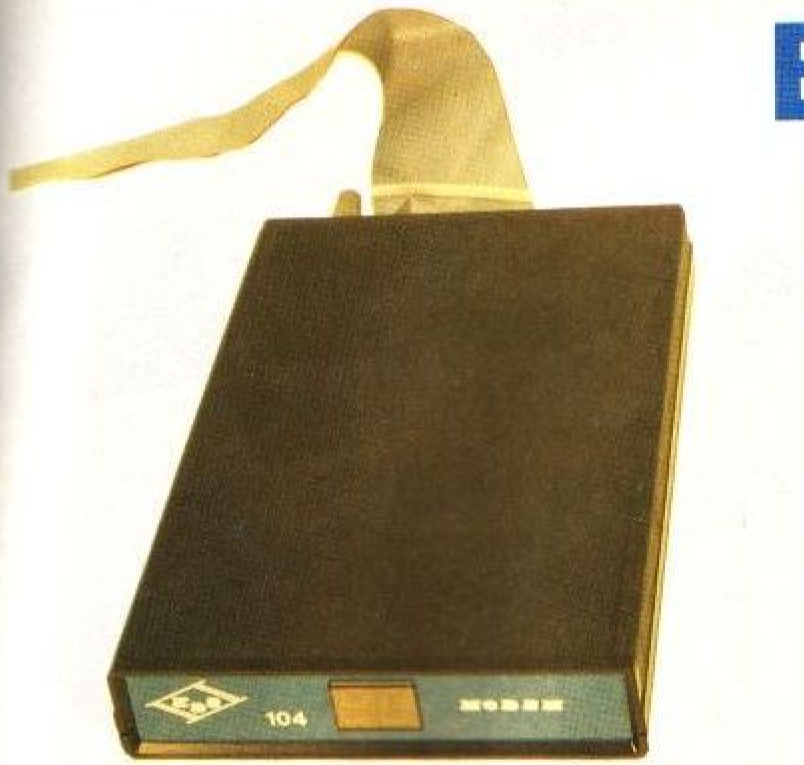
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The KDS104 Modem reviewed

It is frequently amazing the way prices of computers and peripherals drop. The higher the electronic content, the greater the decrease. Disc drives and printers are mechanical, so these will never drop in price in the way that computers and calculators have. A modem is very much an electronic device. As a result a simple acoustic modem which would have cost over £350 three years ago can now be picked up for under £50. More advanced modems boast features which the early micro users would never have dreamed of. These multi-standard modems are becoming increasingly popular. The first Amstrad dedicated modem is now available from KDS.

Hardware

The KDS104 comes in a very smart box. Early models, like the one pictured here, are black, later ones will be grey. The front panel has none of the usual knobs and switches associated with a versatile modem; all the setting up is handled by software. Instead there are two eight segment LEDs which tell you what is going on at any given time.

The box is very light since the power supply is built into the plug. This connects to the only socket on the back of the modem. The 'phone wire is permanently connected, as is the ribbon cable, to the computer's expansion port. The telephone lead has one of the new style connectors but since the modem is not approved it is illegal to connect it to the public telephone system without using a 'buffer box'. The through connector on the disc port works perfectly and allows you to add speech synths, light pens, a disc interface and whatever else you wish to hook up.

Inside, the KDS 104 is not nearly as neat. The single-sided printed circuit board (PCB) has a very cheap feel to it and does not follow the convention of pointing all the chips in the same direction. The chip to drive the LED display has its pins bent up to make the connection. The board is well spaced and remained cool throughout the test. There is not much to building a modem these days thanks to the AMD7910 modem-on a chip. This does all the hard work and is the main reason that the price of modems has dropped in recent months. There are various components to decode the signals from the Amstrad port and an Eprom containing the communications software. It is nice to see third party manufacturers using ROM based software to drive peripherals. This after all is the main reason that Amstrad included sideways ROMs in the design of the CPC464.

All things considered I was impressed by the function of the hardware, if not by it's construction.

Documentation

The KDS modem is packaged in a smart grey and white box. Having spent a lot of money on this, KDS have skimped on the production of the documentation. I hope that the stapled sheets of paper are a stop-gap but nowhere did the documentation claim to be provisional. The whole thing looks as though it has been produced on a DMP-1. This



printer may be adequate for listings but not for explaining how to use a fairly complicated peripheral. The whole manual has been written in capital letters making it hard to read the nine page document.

The actual content, however, is fairly good, although the lack of diagrams is painfully obvious. There is a good amount of forward referencing which means you really have to sit down and read the whole manual before attempting to do anything. It would be much better to be shown how to do

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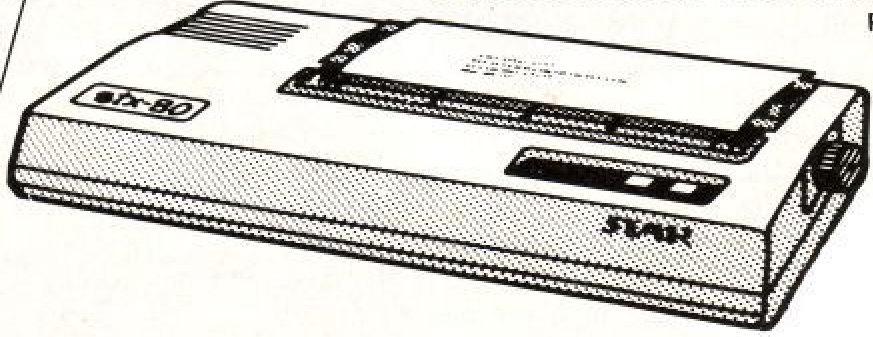
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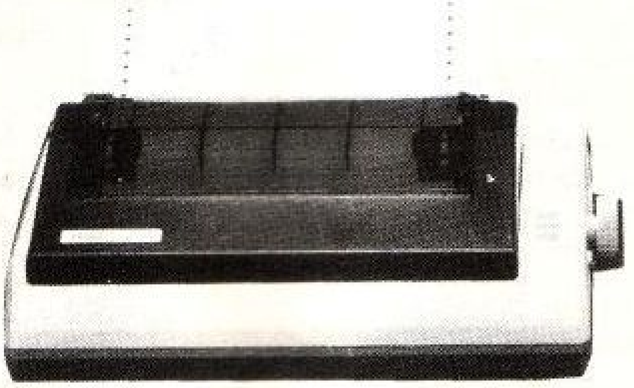
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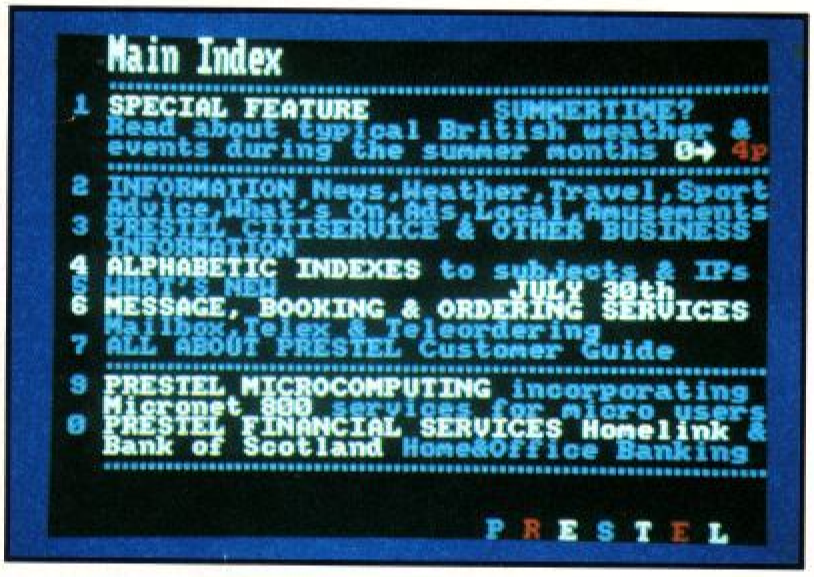
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individual jobs, such as logging into Prestel, or using BT Gold. Even splitting the sub-headings onto seperate pages would help. The tables of available settings do not really explain what you need to type in; a list of the commonly used settings would be helpful. Fortunately, the software can be used as a menu-driven system so a fairly experienced user can cope without the manual. A list of free databases would have been a good idea; there are plenty of them.

Software

It is the software which can make or break a product like this and, with several direct rivals, notably the Amstrad RS232C interface reviewed last month, the KDS programs only just scrape through. Terminal software is very personal, each user has different habits and will want to use the modem for different things. Flexibility and ease of use do not go hand-in-hand. KDS have tried very hard to provide a well-rounded system and have gone some way to succeeding. The | menu command gives a full list of the available RSXes and the | MODEM command sends you through a set of menus to get you on-line. This is all a novice user will need to know to get on-line.

Both the on-screen prompts and the appropriate RSX have the word 'receive' missing the second 'E', the manual gets it right. This is not only a bit sloppy but could mean that software compatible with early versions of the software will not work with later versions, where, I hope, it will be corrected.



Prestel

It is only since the advent of the microcomputer that Prestel has proved popular. It was originally conceived as a system to link televisions and the telephone. It is only now that the six year old project has started to make money.

When Prestel was devised, British Telecom got together with the television companies who were working on teletext (Ceefax and Oracle) to make the two systems as compatible as possible. The result is a complex system of codes to define graphics and colours, these were looked at in detail in last month's "Amstrad User", suffice it to say that the codes allow a picture with eight colours, limited graphics and some special facilities such as flashing and double height text to be transmitted as 1K of information. This builds a screen 40 columns wide by 25 lines deep. To make this work, a character mapped screen is required. The Amstrad's screen is bit mapped, this allows a much better graphical resoloution but means that the 40 column mode only allows for four colours.

The Amstrad RS232C interface compensates for this by using clever software in the twenty column mode. KDS have taken the same route as the Protek modem reviewed in the May issue and used the 40 column mode with only four colours. This means that the display is readable but it does not show you what the author on Prestel expected you to see. Flashing text is shown steady and some of the dynamic frames turn out very garbled. The majority of frames are garbled, it is hard to tell if this is a hardware fault or a bug in the software but, by using another system connected to the same 'phone line, you can see that it is due to the modem misinterpreting valid data.

The most annoying limitation of the Prestel software is the lack of a cursor on the mailbox pages. If you just want to log in, read the news and log off again then the prestel terminal is fine, if you are interested in editing and sending information look elsewhere.

Other databases

Most public databases can be accessed with the KDS 104. The Post Office's Packet Switching System (PSS) links to databases around the world, many Universities and to British Telecom Gold Electronic mail. There are local numbers nearly everywhere, so if you want to log into the American 'Compuserve' database you need only pay for a local call.

Most of the really big databases expect you to have an eighty column display, since there is no way to change the mode through the | modem menu, you will need to set up everything manually using an RSX. A simple Basic program will do the job and you can use this to go through all the logging-in for you, sending your own passwords. I played MUD using the KDS 104 and everything seemed to work OK, other people at 'Amstrad User' have logged into privately run Bulletin boards and have even written a Bulletin board to run on the CPC464 using the Auto-answer mode.

Conclusions

The KDS 104 is a desirable unit. It may not be as finished as I would have liked and there are still some rough edges. Amstrad Technical are amazed that the modem works with such a length of ribbon cable. If you are fussy then I would advise you to wait a few months until the software has settled down and production quantities justify a better internal design. I doubt that the modem will ever get approval since the process requires a huge amount of red tape and would have to extend to the software. My modem did not come with a little red triangle sticker but then it was an early (production) model. In terms of value for money it is excellent, its nearest rival is something like the Amstrad RS232C interface and a standard modem such as a Minor Miracles WS2000 or Pace Nightingale. This set-up would cost a similar amount, be better made and BT approved. It would also be less flexible and not offer such a friendly display to the user. As ever you pay your money and you take your choice.

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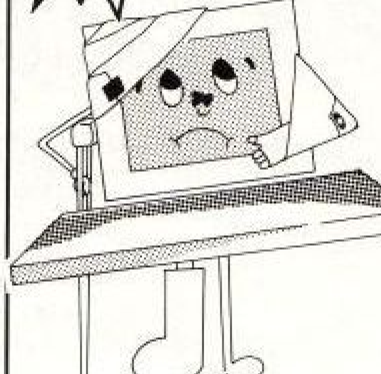
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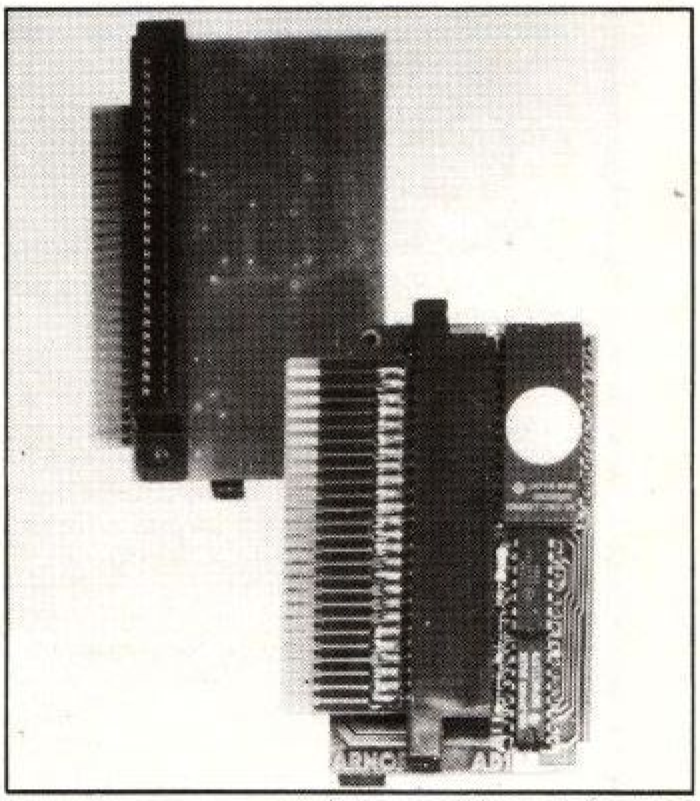
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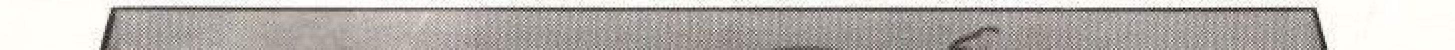
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DMP2000

The New Amstrad that no-one noticed



Amstrad have introduced an amazing new printer at a low price. Alex Martin reports.

Overshadowed by two new models of computer, the DMP2000 slipped quietly into Amstrad's product range at the launch of the 6128 and 8256. Printers, not being as interesting as computers, do not cause the same stir. However, the DMP2000 deserves a fanfare of welcome.

The DMP2000 is the second printer that Amstrad has marketed. The first was the DMP1, a badge engineered machine based on the Seikosha GP500. The DMP1 was basic by any standards and seemed overpriced at its two-hundred pound mark. So how does the DMP2000 compare?

Appearance

Physically, the printer looks very smart, with a tinted perspex cover that covers nearly all of the machine. It stands on two retractable folding legs about ten centimetres above the desk, allowing paper to be stacked neatly underneath.

On the printer itself, there is a mains on/off switch, a manual paper feed knob, a friction/tractor switch, and a control panel containing push buttons and indicators for on line, form feed, line feed, power and paper-out. There is also an internal paper-out bleeper (which can be disabled). Overall the visual effect has been described as 'Space 1999'!

The paper feeds into the printer from the front, making it simple to load single sheets. The print head travels to and fro' across the paper printing down onto it. The paper remains flat as it travels through, making it possible to print on things like postcards and cardboard. The tractor feed is just like a pair of real 'tank type tractors' with sprocket pins, rather than the simple wheel type.

The DMP2000 uses a fabric ink ribbon arrangement with a continuous ribbon stretched between two plastic cases. It cannot be described as a spool-to-spool type, but then it isn't a cassette type either.

Documentation

With the printer you get a printer lead to connect to a CPC computer, a ribbon and a hefty manual - well, hefty in comparison with other printer manuals. This is extremely comprehensive and well-indexed, covering the setting up of the printer, and the commands required for the various print functions and type styles. Amstrad intend to sell the printer to other computer users beside Amstrad users and this is

reflected by the inclusion of instructions to use the printer in different dialects of Basic. These include Amstrad Basic, Microsoft Basic, Spectrum Basic, BBC Basic and Commodore Basic. No previous knowledge of printers is assumed and the manual explains how to use the printer to the novice user. At the back of the manual are some example programs. One, written in Basic, will turn your Amstrad and printer into a simple typewriter. The other two are screen dump programs.

In Use

So far, I have not described any of the things that the printer will do. Well, I wanted to save the best bit until last! The printer will produce well over a hundred different combinations of typeface, typestyle, and option (such as double width or underline). It has two distinct typefaces: NLQ (Near Letter Quality) and draft quality. These can be printed in a proportional character set, mini (twelve characters per inch) or standard (ten characters per inch). The draft quality can also be printed in condensed. The various other options include superscript and subscript to print scientific functions (such as the 'th' after 12th etc.) in addition to italics, bold, and double strike. Bold and double strike both print the image twice. Bold, however, prints the image slightly offset, broadening the upright lines. The NLQ character set is very good indeed particularly when used in conjunction with proportional. Use of super or subscript text in condensed mode produces fine print, making the printer suitable for the legal profession and mail order companies! Both NLQ and draft quality text have true descenders.

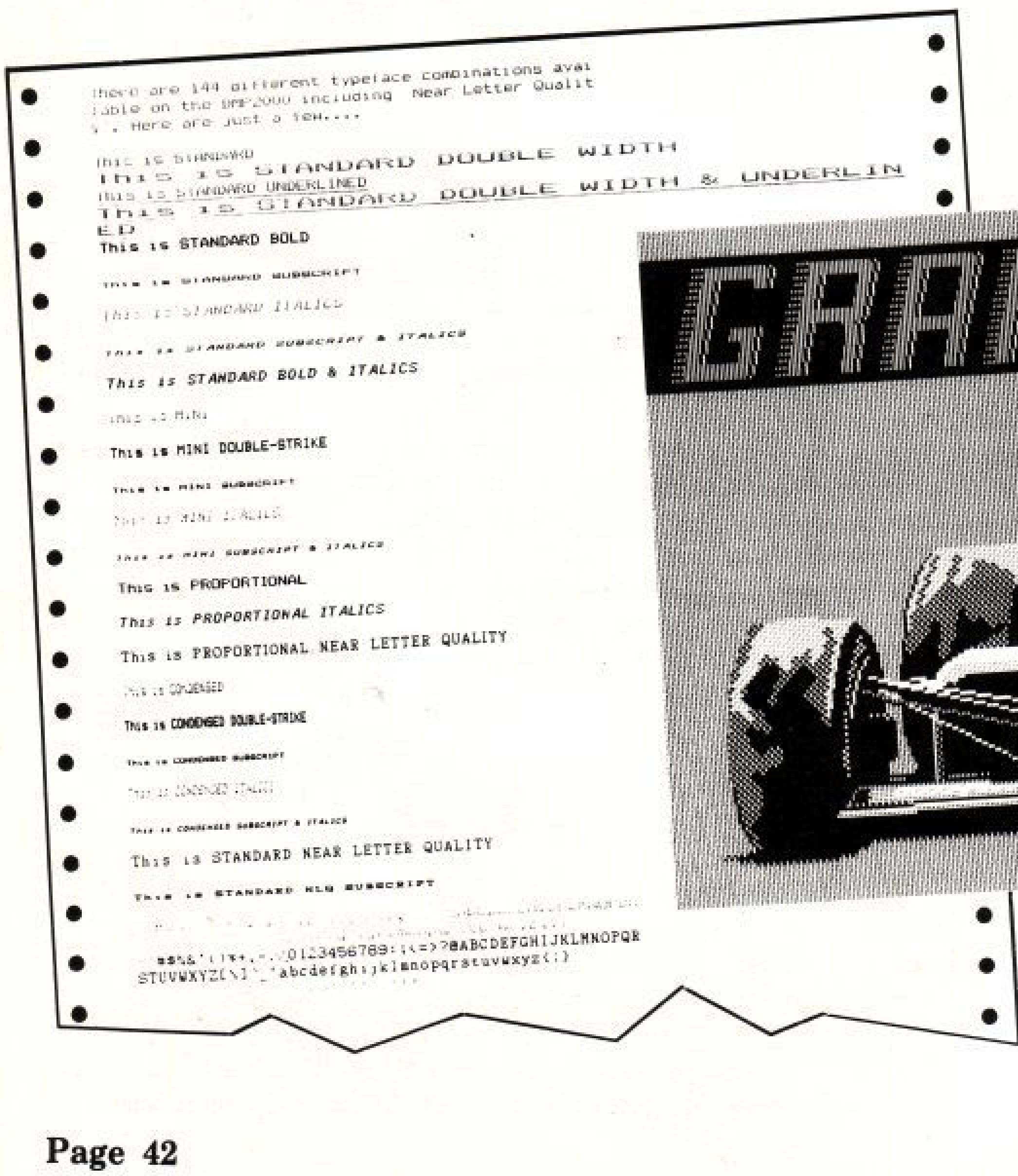
On the graphics side, the printer has many different modes giving different densities and print speeds of graphics printing. Line spacing can be set to very precise increments making it easy to write screen dump and graphics printing programs. Industry standard 'Epson' control codes are used, so the DMP 2000 will work with any software which supports an Epson printer. Some very impressive pictures have already been produced using the DMP2000.

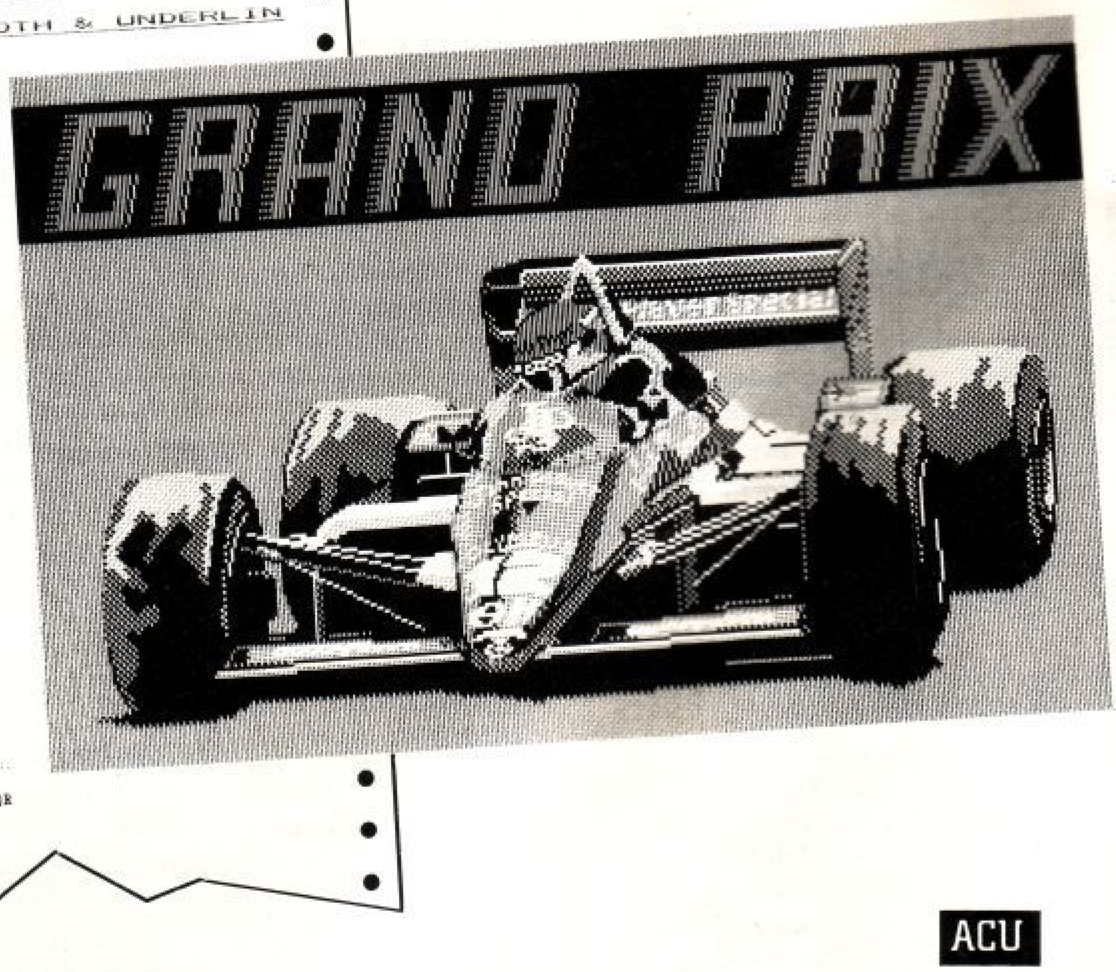
Just about every feature you could possibly want to set the layout of a page has been included. Horizontal tabs, vertical tabs, vertical tabs selected by channel, perforation skip, page length setting, margin setting, paper feed in both directions, can all be altered by programming the printer. There is even a command to make the print head move at half the speed.

The printer will produce international characters either by setting the dip switches, or through software. If the specific character that you require is not available, then there is an intricate definable character facility.

Price

So how much do you think a printer with this specification would cost? The Riteman F on which the DMP2000 is based sells for £315. The nearest competitor is the Epson LX80 which has a marginally better NLQ mode costs £250. Amstrad intend to sell the printer for £159.95. This makes it outstanding value for money. What with the large number of features and various character sets, the NLQ printing and distinctive design, the DMP2000 will surely be a winner. The sales of this product will surprise even Amstrad.





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Roland Takes a Running Jump

One of the staples of the computer gamer's diet is the platform-type game, which features a lot of leaping about and treasure collecting. Peter Green starts a series showing how to write your own.

One of the games that will go down in computing history as a landmark is Manic Miner, a game which originally appeared on the Spectrum and whose success brought forth an army of clones: Jet Set Willy, Jet Set Willy II, Blagger... Most of these games have been converted to run on the Amstrad computers, and you have all probably seen one version or another.

The basic principle is that you have a number of screens built of various types of platform. The player uses a joystick or the keyboard to control a little figure who can run left and right, or jump into the air. Scattered about each screen are both pieces of treasure, which you have to collect, and

nasties of various types, often moving, which you have to avoid.

The object of this series is to give you an insight into the problems involved in writing such a game, and the techniques used to overcome the problems. As an example, month by month we'll build up the code for a demo program called (for obvious reasons) 'Roland Takes A Running Jump'. Our hero will be Amstrad's mascot Roland, who will have to leap about the various floors of the Amstrad company offices collecting 3" floppy discs.

Spritely Moves

Obviously the most important, and therefore the first point to consider, is the graphical representation of each play level on the screen. A screen consists of two basic elements: the background of platforms and fixed hazards which never changes, and the player, treasure, and moving hazards which do change.

The fixed background is no problem. It only has to be drawn once, at the start of a level, and can then be neglected provided we arrange for the moving elements not to corrupt it. It's the moving elements themselves which provide the first obstacle.

The type of gameplay we will incorporate is the same as Manic Miner: the player cannot fall through the platform he is standing on, but he can jump up 'through' a platform above him. Thus we need to draw the player's character over the background in such a way that, when he moves on, theback ground re-appears as it was before.

Some computers have sprites as part of their graphics capability. Normally, the pictures on the TV display are generated from the data stored in screen memory: on the Amstrad, screen memory is a 16K block. Put very simply, a sprite is a graphics shape which appears on the TV display without its data being stored in the screen memory. Its data is actually stored elsewhere in the computer, together with data telling the system where on the screen the sprite is supposed to appear. When this point is reached, the hardware generates the TV frame video signal from the sprite data instead of the screen data, so the sprite seems to appear in front of the screen background. Thus sprite graphics can very easily be put on screen, moved around, and taken off again without any effect on the background.

None of the Amstrad computers have this hardware sprite capability. To make something appear on the screen, its data must be written into screen RAM, even if that means overwriting background data. However, there are two methods we can use to produce a 'software sprite'. The first is really pretty obvious: when we want to draw a shape over a piece of background, first copy the section of the screen which is going to be altered into a safe section of memory. Later, we can erase the shape and restore the background exactly as it was by copying the data back again to its original position. This will give an effect that looks just like a hardware sprite, but we won't be using it for our program.

Over and Out

Instead, we'll be drawing our moving characters using XOR mode. Many of you will know what this means, but I'll briefly explain it for the benefit of readers who don't understand logical operators.

Normally, drawing a shape on-screen means taking numbers rom one part of memory (a table of data for the graphic shapes), and copying it into another part of memory (the screen memory). It replaces whatever was there before. But the Z80 processor at the heart of the Amstrad also lets us combine numbers with the ones already existing in a memory byte, using various logical rules, or operators. The operator we're interested in is XOR. The table below shows what the result bit is for each possible combination of bit pairs in the two original numbers. In English, the XOR rule is 'the result bit is a zero if both bits are the same, and a one if the two bits are different'. The first example shows how to XOR two numbers together, using the table or the above rule:

First bit	0011
Second bit	0101
Result bit	0110

Example 1:	11010110	Example 2:	10100010
	XOR		XOR
	01110100		01110100
	gives		gives
	10100010		11010110

But now look at example 2. If we take the answer from example 1, and XOR it with one of our starting numbers, the result is the other number that we started with. This always works with XOR: test a few examples to see for yourself. If we take a number, and XOR it twice with another number, we always get the first number back unchanged.

The point of this mathematical diversion is that, if we draw a shape onto the screen using XOR mode, it appears: drawing it a second time in the same place makes it disappear, and we get our original background back as a bonus! The only disadvantage is that new colours may appear at the points where background and shape overlap, as new bit patterns are produced in the screen memory. However, we (and most commercial games of this type) will put up with this for the sake of convenience. Readers lucky enough to own a copy of the excellent game 'Sorcery' will be familiar with the weird colours that appear when characters cross over each other, and this is the reason.

Speed Limits

Now you might think we're laughing, as the Amstrad TAG option lets us print characters using graphics XOR mode. Our second problem rears its ugly head now: speed. For smooth, flicker-free animation, we've got to add and remove characters from the screen fast. Let's do some experiments. Program 1 is a BASIC listing that fills the Mode 1 screen with characters. Run it and time it and you find BASIC needs about 6.5 seconds to print a thousand characters: about 6.5 milliseconds per character.

But the screen is displayed at 50 frames a second, 20 milliseconds a frame. Chop off the time each frame when the hardware is testing the keyboard, updating the sound

chip and doing all the other housekeeping tasks, and you can see we only have time to remove and redraw one or two characters per frame before flicker starts to occur. And we haven't even considered things like checking for legal moves, treasure, scores and time left! We need a speed improvement, or we'll have a very dull game.

Can machine code provide a solution? Surprisingly, the answer is no. Program 2 is a routine that fills a Mode 1 screen with characters (for variety, in vertical strips instead of horizontal rows), using the firmware routines that BASIC would normally use. The routine cycles through all 256 built-in characters, so first the program selects all characters to be taken from ROM, and enables the ROM so that we can read from it. Each character column in Mode 1 is two bytes of screen memory wide, so we move across the screen in two-byte increments (the double CALL to SCR NEXTBYTE) writing vertical strips of characters. For each character we must find the address of the eight bytes that make up its matrix, unpack the matrix into the corresponding set of pixel masks for a Mode 1 screen, then combine each mask with the encoded ink we're using, and copy the result into the right place on the screen.

And the time saving? This routine takes about four seconds to fill the screen, a rate of two to three characters per frame scan. Still no good, and we simply can't go any faster using standard routines. Machine code may be fast, but the complicated organisation of the Amstrad screen means a great deal of work has to be done to print a character, which slows things down again. We have to come up with a new trick.

The Plotting Thickens

Well, the fundamental limit of speed is the time it takes just to write the correct data from one place in memory to another: we can't do that any faster. The real time-waster in Program 2 is the conversion of a character from its stored form into its screen form. Cut out that step and we'll be plotting shapes on screen as fast as we can.

So for smooth animation of a number of shapes, we store our graphics already encoded into their screen data format. An example is given in Program 3, which includes the encoded data for a checker board character. The program plots the character at a point on screen given by the given starting screen address (&F830): the call to KM WAIT CHAR is a machine code 'Press any key to continue', after which the character is re-plotted in the same place and thus disappears, as we showed above.

This is fast, but we can do slightly better. Program 3 uses the proper firmware calls to step right and down through the screen memory map, which is often a complicated process. This is due to the very complex addressing system used by the Amstrad hardware, which becomes even worse if scrolling has taken place. It means a great deal of checking has to be done to move around the screen map.

However, we can make a few short-cuts provided we don't scroll the screen after selecting the screen Mode. In this case, the screen addressing looks like Figure 1. It still looks complicated, but provided we don't try to move off the sides, top or bottom of the screen, we can use the following rules. To move right or left one byte, add or subtract one to the screen address. To move down one row, add 2048 (&800) to the screen address. If the carry flag is clear after this, the answer is the new screen address (for example, the byte below &D800 in Figure 1 is &D800+&800 = &E000).

If the carry is set, though, indicating an overflow past &FFFF (the top of memory), we have to add a further correction factor. This consists of &C000 (which takes us back to the start of the screen memory map), and &50 (which takes us to the next row in the same 2K block). For example, adding &800 to &F801 gives &0001 and the carry flag set. Adding another &C050 gives &C051 as the required address, which Figure 1 shows is the correct answer.

Screen momory map if no scrolling has occured after Mode change

80 (&50) bytes

FIRST EIGHT PIXEL LINES	C000	C001	......	.C04E	C04F
	C800	C801	......	.C84E	C84F
	D000	D001	......	.D04E	D04F
	D800	D801	......	.D84E	D84F
	E000	E001	......	.E04E	E04F
	E800	E801	......	.E84E	E84F
	F000	F001	......	.F04E	F04F
	F800	F801	......	.F84E	F84F
SECOND EIGHT PIXEL LINES	C050	C051	......	.C09E	C09F
	C850	C851	......	.C89E	C89F
	.	.		.	.
	.	.		.	.
	.	.		.	.
	.	.		.	.
	.	.		.	.
	.	.		.	.
LAST EIGHT PIXEL LINES	C780	C781	......	.C7CE	C7CF
	CF80	CF81	......	.CFCE	CFCE
	D780	D781	......	.D7CE	D7CF
	DF80	DF81	......	.DFCE	DFCF
	E780	E781	......	.E7CE	E7CF
	EF80	EF81	......	.EFCE	EFCF
	F780	F781	......	.F7CE	F7CF
	FF80	FF81	......	.FFCE	FFCF

ALL ADDRESSES IN HEX

Program 4 incorporates these improvements, and takes just under one second to print 1000 characters. As an added bonus, there's no reason why we can't encode our data so that shapes appear multicoloured on the screen. To do that using the firmware routines would have required over printing several characters to produce the extra colours, whereas our system requires no extra time at all.

Typing in the Programs

Since most of the programs have been written in machine code it is usually necessary for you to have an assembler so that you can enter the programs (I use Maxam), so that anyone who is new to machine code, and doesn't have an assembler, can enter the program a small Basic program which reads data and pokes the machine code in is provided.

Program 1

```
10 MODE 1
20 FOR i=1 TO 40*25
30 PRINT "A";
40 NEXT
50 GOTO 50
```

Program 2 - Machine code

```
        ORG &8000
        LD DE,256
        CALL &BBAB      ;TXT SET M TABLE
        CALL &B906      ;KL L ROM ENABLE

filscr  LD A,1
        CALL &BC0E      ;SCR SET MODE
        LD HL,&C000     ;start of screen
        XOR A           ;set A=0
        LD B,40

loop0   PUSH BC         ;save loop0 counter
        PUSH HL         ;save screen address
        CALL vstrip
        POP HL          ;restore screen address
        PUSH AF
        CALL &BC20      ;SCR NEXT BYTE
        CALL &BC20      ;SCR NEXT BYTE
        POP AF
        POP BC          ;restore loop0 counter
        DJNZ loop0
        RET             ;end of program
        VSTRIP           ;enter with HL pointing to
                         screen address at top of
                         strip

         PUSH AF
         LD B,25         ;screen height in rows
         LD A,1          ;use ink 1
         CALL &BC2C      ;SCR INK ENCODE
        LD (encink),A ;store encoded ink
        POP AF
loop1   PUSH BC
        PUSH AF
        PUSH HL
        CALL &BBA5      ;TXT GET MATRIX
        LD DE,unpack
        CALL &BC53      ;SCR UNPACK
        POP HL          ;get screen address

        LD DE,unpack
        LD A,(encink)
        LD C,A          ;put encoded ink in C
        LD B,8          ;line counter

loop2   LD A,(DE)       ;get pixel mask
        AND C           ;combine with encoded ink
        LD (HL),A       ;put in screen address
        PUSH HL         ;save screen address
        CALL &BC20      ;SCR NEXT BYTE
        INC DE          ;point to next pixel mask
        LD A,(DE)       ;get pixel mask
        AND C           ;combine with encoded ink
        LD (HL),A       ;save in screen address
        POP HL          ;restore previous screen address
        CALL &BC26      ;SCR NEXT LINE
        INC DE          ;next pixel mask
        DJNZ loop2
        POP AF          ;restore printing character
        INC A           ;next ASCII character
        POP BC          ;restore loop counter
        DJNZ loop1
        RET

encink BYTE 0
unpack RMEM 16
```

Program 2 - Basic poker

```
5 valid$="0123456789ABCDEF":ln=1000
10 FOR x=&8000 TO &8060 STEP 8
20 FOR y=0 TO 7
30 READ num$
40 IF (INSTR(valid$,LEFT$(num$,1))<>0) A
   ND (INSTR (valid$,RIGHT$(num$,1))<>0)
    THEN num=VAL("&"+num$):POKE x+y,num
   ELSE 100
50 chk=chk+num
60 NEXT:ln=ln+10
70 READ check:IF chk<>check THEN 110
80 chk=0:NEXT
90 CALL &8000
95 END
100 PRINT"Invalid character in line ";ln
    :END
110 PRINT"Checksum error in line ";ln:EN
    D
1000 DATA 11,00,01,CD,AB,BB,CD,06, 792
1010 DATA B9,3E,01,CD,0E,BC,21,00, 688
1020 DATA C0,AF,06,28,C5,E5,CD,26, 1082
1030 DATA 80,E1,F5,CD,20,BC,CD,20, 1260
1040 DATA BC,F1,C1,10,EF,C9,F5,06, 1329
1050 DATA 19,3E,01,CD,2C,BC,32,60, 671
1060 DATA 80,F1,C5,F5,E5,CD,A5,BB, 1597
1070 DATA 11,61,80,CD,53,BC,E1,11, 960
1080 DATA 61,80,3A,60,80,4F,06,08, 600
1090 DATA 1A,A1,77,E5,CD,20,BC,13, 979
1100 DATA 1A,A1,77,E1,CD,26,BC,13, 981
1110 DATA 10,EE,F1,3C,C1,10,D3,C9, 1176
1120 DATA 00,00,00,00,00,00,00,00, 0
```

Program 3 - Machine Code

```
        org &8000
        LD A,1
        CALL &BC0E ;SCR SET MODE

        LD HL,&F830
        LD DE,grafx
        LD BC,&0208
        CALL plot

       CALL &BB06  ;KM WAIT CHAR

        LD HL,&F830
        LD DE,grafx
        LD BC,&0208
        CALL plot

        RET

plot    PUSH BC      ;save width and row counter
```

```
        PUSH HL     ;save screen address of start of current row
do_row  LD A,(DE)   ;get byte of graphic data
        XOR (HL)    ;XOR it with the contents of screen address
        LD (HL),A   ;put new screen data back into screen
        CALL &BC20  ;SCR NEXT BYTE
        INC DE      ;point to next byte of graphics data
        DJNZ do_row ;loop back until whole row plotted
        POP HL      ;fetch screen address of row start
        CALL &BC26  ;SCR NEXT LINE
        POP BC      ;fetch width and row counter
        DEC C       ;decrement row counter
        JR NZ,plot  ;loop back until all rows plotted
        RET
grafx   BYTE &AA,&AA,&55,&55
        BYTE &AA,&AA,&55,&55
        BYTE &AA,&AA,&55,&55
        BYTE &AA,&AA,&55,&55
```

Program 3 - Basic Poker

```
5 valid$="0123456789ABCDEF":ln=1000
10 FOR x=&8000 TO &8060 STEP 8
20 FOR y=0 TO 7
30 READ num$
40 IF (INSTR(valid$,LEFT$(num$,1))<>0) A
   ND (INSTR (valid$,RIGHT$(num$,1))<>0)
    THEN num=VAL("&"+num$):POKE x+y,num
   ELSE 100
50 chk=chk+num
60 NEXT:ln=ln+10
70 READ check:IF chk<>check THEN 110
80 chk=0:NEXT
90 CALL &8000
95 END
100 PRINT"Invalid character in line ";ln
    :END
110 PRINT"Checksum error in line ";ln:EN
    D
1000 DATA 3E,01,CD,0E,BC,21,30,F8, 799
1010 DATA 11,35,80,01,08,02,CD,21, 447
1020 DATA 80,CD,06,BB,21,30,F8,11, 872
1030 DATA 35,80,01,08,02,CD,21,80, 558
1040 DATA C9,C5,E5,1A,AE,77,CD,20, 1183
1050 DATA BC,13,10,F7,E1,CD,26,BC, 1126
1060 DATA C1,0D,20,ED,C9,AA,AA,55, 1101
1070 DATA 55,AA,AA,55,55,AA,AA,55, 1020
1080 DATA 55,AA,AA,55,55,4F,06,08, 688
1090 DATA 1A,A1,77,E5,CD,20,BC,13, 979
1100 DATA 1A,A1,77,E1,CD,26,BC,13, 981
1110 DATA 10,EE,F1,3C,C1,10,D3,C9, 1176
1120 DATA 00,00,00,00,00,00,00,00, 0
```

Program 4 - Machine Code

```
        org &8000

        LD A,1
        CALL &BC0E   ;SCR SET MODE

        LD HL,&C000  ;start address on screen

        LD B,25
loop1   PUSH BC
        PUSH HL
        LD B,40
loop2   PUSH BC
        PUSH HL
        LD DE,grafx
        LD BC,&0208  ;character is two bytes wide (B), eight rows deep (C)
        CALL plot
```

```
        POP HL
        INC HL
        INC HL
        POP BC
        DJNZ loop2
        POP HL
        LD BC,&50
        ADD HL,BC
        POP BC
        DJNZ loop1
        RET          ;end of main program
plot    PUSH BC      ;save width and row counter
        PUSH HL      ;save screen address of start of current row
do_row  LD A,(DE)    ;get byte of graphic data
        XOR (HL)     ;XOR it with the contents of screen address
        LD (HL),A    ;put new screen data back into screen
        INC HL       ;step screen address right one byte
        INC DE       ;point to next byte of graphics data
        DJNZ do_row  ;loop back until whole row plotted
        POP HL       ;fetch screen address of row start
        LD BC,&800   ;offset of 2048 bytes to next row
        ADD HL,BC    ;add offset to screen address
        JR NC,no_cor ;no carry, so no correction needed
        LD BC,&C050  ;correction factor for wrap-around
        ADD HL,BC    ;add correction
no_cor  POP BC       ;fetch width and row counter
        DEC C        ;decrement row counter
        JR NZ,plot   ;loop back until all rows plotted
        RET
grafx   BYTE &AA,&AA,&55,&55
        BYTE &AA,&AA,&55,&55
        BYTE &AA,&AA,&55,&55
        BYTE &AA,&AA,&55,&55
```

Program 4 - Basic poker

```
5 valid$="0123456789ABCDEF":ln=1000
10 FOR x=&8000 TO &8060 STEP 8
20 FOR y=0 TO 7
30 READ num$
40 IF (INSTR(valid$,LEFT$(num$,1))<>0) A
   ND (INSTR (valid$,RIGHT$(num$,1))<>0)
    THEN num=VAL("&"+num$):POKE x+y,num
   ELSE 100
50 chk=chk+num
60 NEXT:ln=ln+10
70 READ check:IF chk<>check THEN 110
80 chk=0:NEXT
90 CALL &8000
95 END
100 PRINT"Invalid character in line ";ln
    :END
110 PRINT"Checksum error in line ";ln:EN
    D
1000 DATA 3E,01,CD,0E,BC,21,00,C0, 695
1010 DATA 06,19,C5,E5,06,28,C5,E5, 929
1020 DATA 11,41,80,01,08,02,CD,28, 466
1030 DATA 80,E1,23,23,C1,10,EF,E1, 1096
1040 DATA 01,50,00,09,C1,10,E3,C9, 727
1050 DATA C5,E5,1A,AE,77,23,13,10, 815
1060 DATA F9,E1,01,00,08,09,30,04, 544
1070 DATA 01,50,C0,09,C1,0D,20,E8, 752
1080 DATA C9,AA,AA,55,55,AA,AA,55, 1136
1090 DATA 55,AA,AA,55,55,AA,AA,55, 1020
1100 DATA 55,A1,77,E1,CD,26,BC,13, 1040
1110 DATA 10,EE,F1,3C,C1,10,D3,C9, 1176
1120 DATA 00,00,00,00,00,00,00,00, 0
```

Next Month - Part Two

ACU





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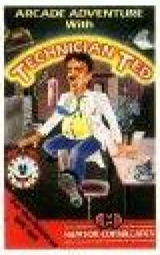
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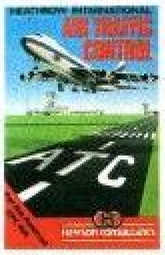


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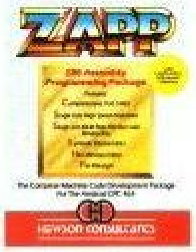
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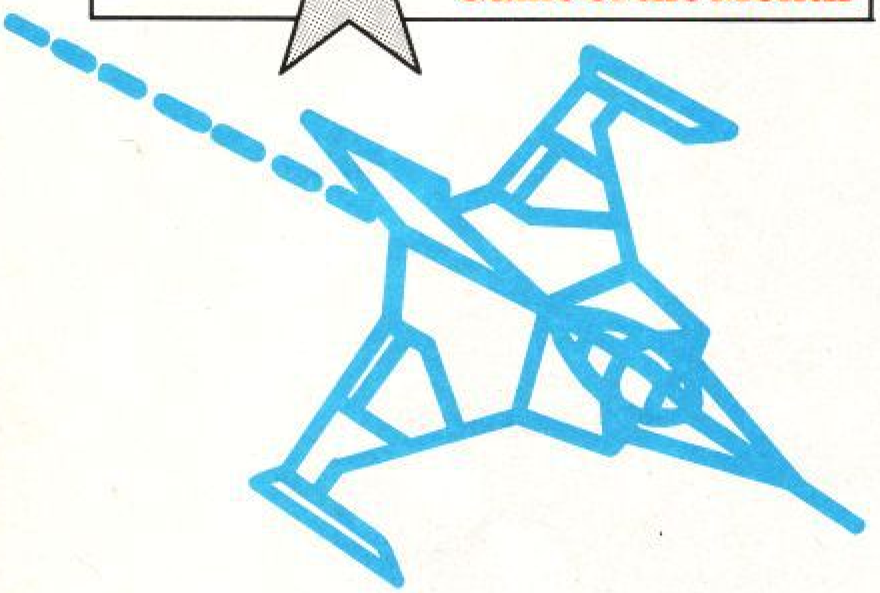
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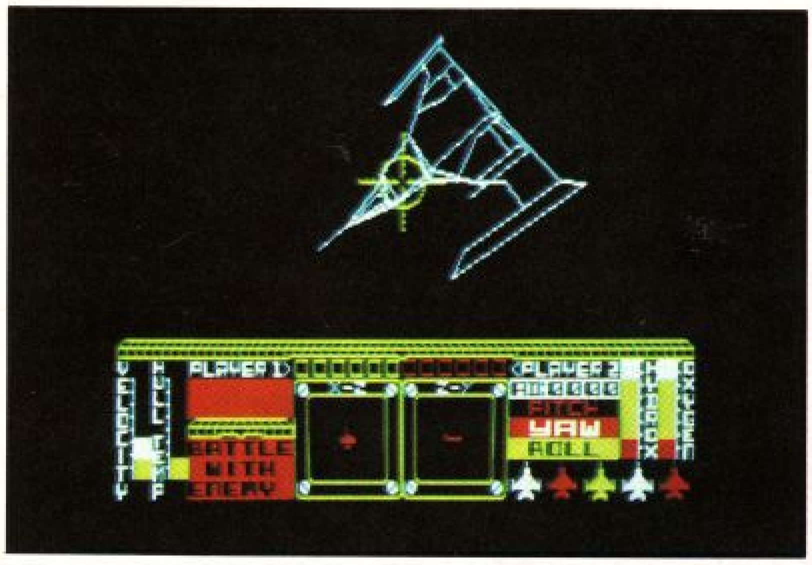
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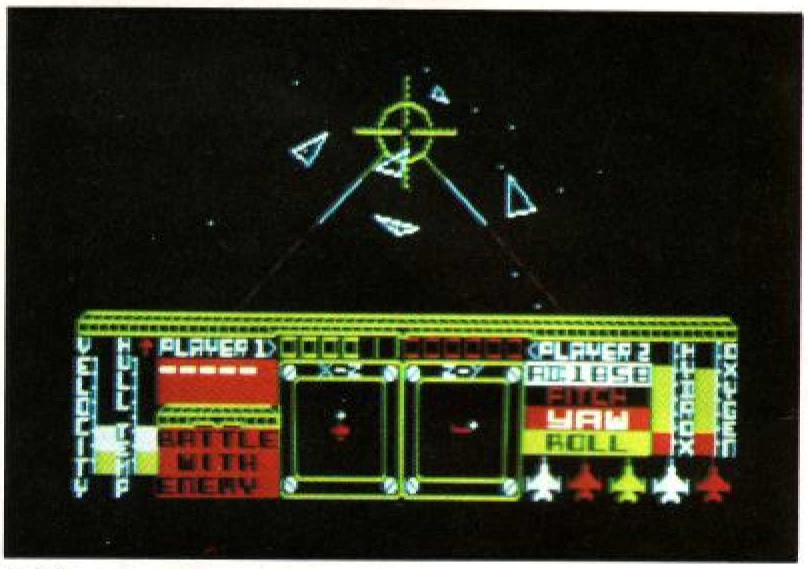
Game of the Month



There have been several games that have included some form of 3-D graphics with varying degrees of success. In general, wire frame 3-D is usually preserved for the realms of outer space and so it is with Starion. 'Big deal' I hear you cry, '....so what's so good about this one?' Well, in terms of speed and smoothness there is nothing that comes anywhere near Starion. Complex enemy craft tumble and roll before your very eyes as if there were not thousands of complicated sums being processed for each frame. All this maths is fitted into only a small fraction of the time between frame flybacks so that there is still time to get the information onto the screen without any flicker at all - this is truly amazing and even the original designer of the Amstrad was seen to gasp in awe.

Pretty graphics aren't of course everything, they should merely serve to enlighten a good game plan. Thankfully, this is also the case in Starion. The cassette inlay waffles on about time being muddled and how one has to move the correct things to the correct time zones in order to put everything straight. In play, a time zone is picked and then battle commences.



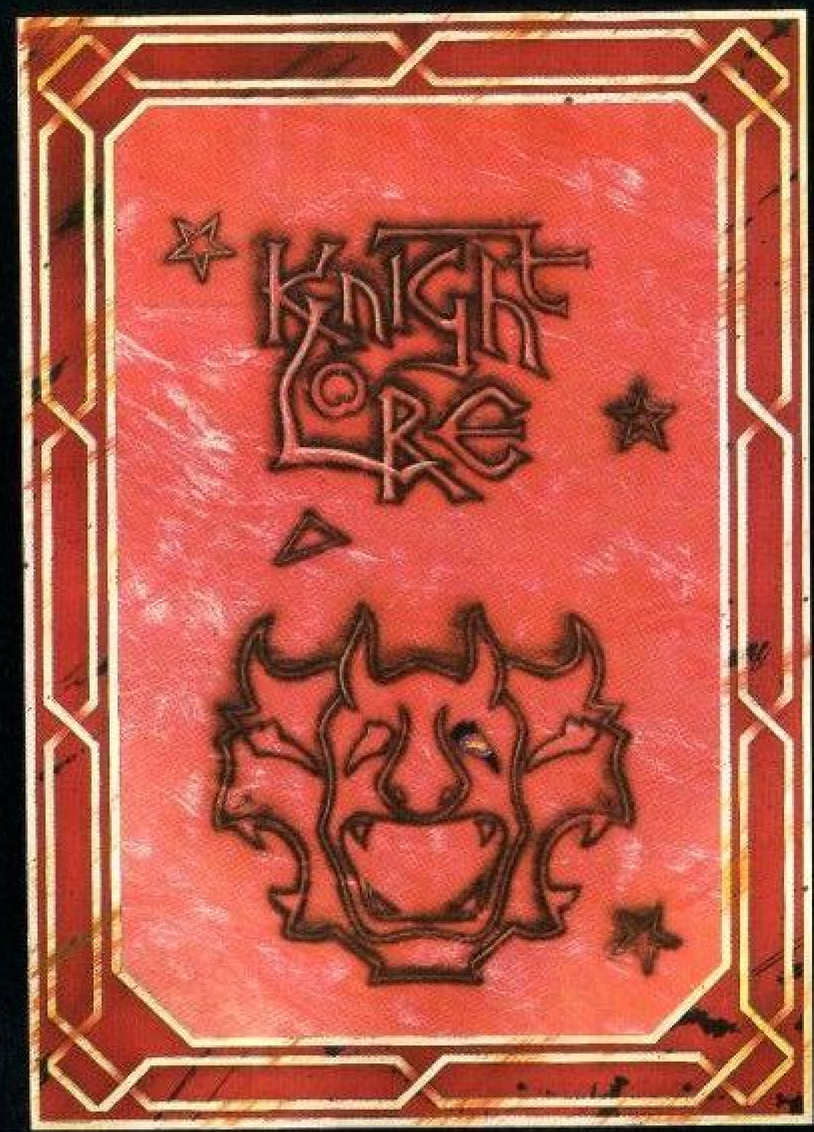


You pilot your ship through the stars zapping a large number of different enemy craft. As each one is hit, you have time to swing round and see the debris elegantly reform into a letter of the alphabet. Your task is then to fly into this so that it may be sucked into your cargo hold. Depending on the time zone picked, there are a different number of letters needed to fill the hold. Having shot enough craft and collected a full complement of letters, you are then invited to fly to a teleport, which you must in fly to the middle of in order to be taken back to a screen where one can unravel the anagram of letters that have been collected (an easy example is ECE which is obviously (?) EEC). Having unravelled the anagram, one must then pick the time zone for which you think the word applies (EEC is 1957, the year in which the Treaty of Rome was produced (I have to admit that for most of the clues I used a crib sheet that was published in another mag' some time ago - but then I've only got the mentality of a games reviewer).

Having entered the new time zone, one must first fly to a planet at which point you find out if you have picked the correct time zone, and if not, you get to see the clue for that zone (which may be of use later) and then have the opportunity to battle on to get another chance to pick the correct zone. If the answer was correct, then you can start shooting ships and collecting letters for another word.

Not only has David Webb managed to cram an enormous amount of 3D wire frame info' into this game, there are also a huge number of clues and anagrams to give even the keenest brain a run for its money. At the start, you are given the opportunity to pick the number of players and game controls (though the process is a bit tedious). You can also pick tuition which has the ultimate in scrolly messages - in 3-D. Better still for hackers, the text is held in ASCII and can be changed to your own personalised version. In flight, the controls are very responsive (almost too much so) and a panel at the bottom of the screen gives a host of useful information. Obviously, the number of remaining ships, along with the current state of the current one, are shown. The speed and temperature of the hull is also shown and it is important not to let it overheat. In the centre, two radar screens are shown, one for the X-Y direction (for which the enemy blob should be kept directly above the small ship in the middle) and the second is Y-Z which, is in effect, a




Knight
Lore

ESP THE PEN THAT LIKES TO SAY YES

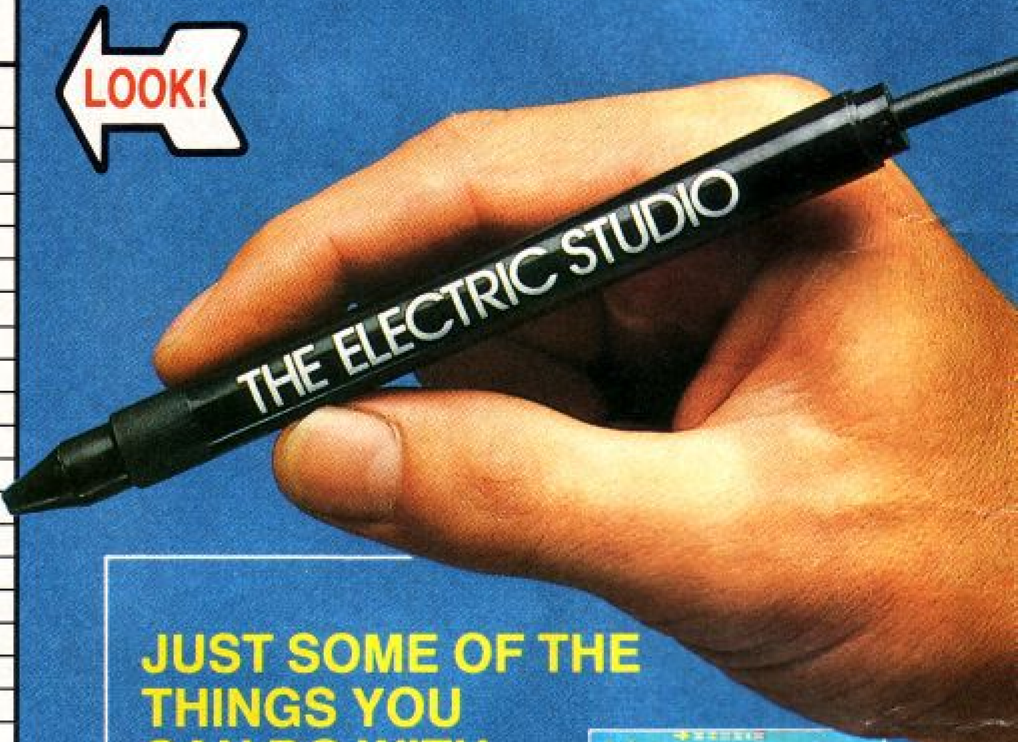
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ELASTIC DIAMOND	YES	NO	
ELASTIC POLYGON	YES	NO	
ELASTIC HEXAGON	YES	NO	
ELASTIC OCTAGON	YES	NO	
ELASTIC CUBE	YES	NO	
ELASTIC PYRAMID	YES	NO	
CIRCLES	YES	YES	
SOLID CIRCLES	YES	NO	
SOLID BOXES	YES	NO	
SOLID ELLIPSES	YES	NO	
WEDGES	YES	NO	
BEZIER SIMULATIONS	YES	NO	
ZOOM EDIT	YES	YES	
REVERSE/MIRROR IMAGES	YES	NO	
REFERENCE BACKGROUND	YES	NO	
GRID BACKGROUND	YES	NO	
X,Y DISPLAY OPTION	YES	NO	
PAINT FILL	YES	YES	
COLOUR WASHING	YES	NO	
RESIDENT SCREEN DUMP	YES	NO	
3D EDGE PLOTTING	YES	NO	
TEXT	YES	YES	
9 BRUSH SIZES	YES	NO	
18 SPRAY NOZZLES	YES	NO	
4 BASIC TEXTURES	YES	NO	
TEXTURE VARIATION	YES	NO	
XOR TEXTURE SHADING	YES	NO	
RESIDENT SYMBOL/SHAPE FILE	YES	NO	
RESIDENT FLECK PRINT FILE	YES	NO	
26 PAPER COLOURS	YES	NO	
15 COLOUR/TONE PALETTE	YES	NO	
POINT SETTING	YES	YES	
FIXED POINT RAYS	YES	NO	
MIRROR DRAWING	YES	NO	
HOME FUNCTION	YES	NO	
KEY CONTROL NUDGE	YES	YES	
JOYSTICK NUDGE	YES	NO	
AVAILABLE FOR 464	YES	YES	
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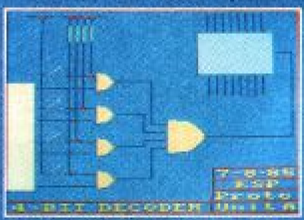


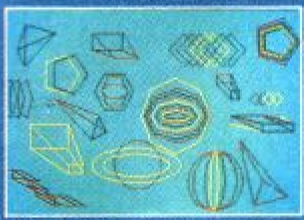
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measure of the range (the blob should be kept to the right and slightly above the ship in the centre).

It's not often I'm amazed by a new program for the Amstrad machines (the first time was probably for Sorcery when it first appeared, and the second time was for the two Ultimate games), but I am truly amazed by Starion. Just to update the screen at the rate they are managing to do so without flicker is pretty good, but to do 3-D calculations in the same time is just incredible. Add to this the fact that the game in which these graphics are used is also pretty good means that this is bound to be a sure fire winner.

Author	Melbourne House
Format	Cassette
Price	£9.95
Graphics	*****
Addictiveness	*****
Playability	*****
Overall	*****

Macadam Bumper

This is the first French import I have seen. It works on the 464 & 664 but not the 6128. This is a pinball table construction set. One strange feature of this cassette: it has the Amstrad version on one side and the Spectrum version on the other. This is going to confuse the shop assistants isn't it?



The first thing you see on loading is a snazzy screen of a punk thumping a pinball table. If you don't get this, you are probably trying to load the Spectrum version (Twit!). The game is fairly long and takes a while to load, but when it is done you get a main menu (in English) and a snazzy little tune. When you get to the game, you notice that about one third of the screen is taken up by a sexist drawing. Now, I like sexist drawings, but not when they do nothing but take up one third of my playing area. Also, when you change ink colours, she looks awfully strange.

After you get tired of flipping the ball around the screen, you can design your own screen. The first bit I re-designed was the little chute off the side from which your balls can exit the field of play without scoring you any points - I plugged it! Misplaced bits can be rubbed out, and there is a limit to the number of flippers you can have. This is probably because the game slows down quite noticeably when you 'flip', and flickers more than usual.



Apart from these restrictions, you have to do all the debugging of the pinball table. It is quite possible to create traps for a ball which just continually clock up your score -high scoring alright, but as interesting as watching a cornflake go soggy. Fortunately, there's an 'I give up' key to get out of this kind of situation.

Unlike the last pinball game we reviewed, this one has a 'tilt' on it. Don't swirl the keyboard around - you'll only unplug it, there are special tilt keys on the keyboard.

My only complaints are the size of the board and the lack of 6128 compatibility. As an extra incentive, PSS are running a competition with a prize of a real pinball machine to the designer of the best screen.

Author	PSS
Format	Cassette
Price	£7.95
Graphics	**
Addictiveness	***
Playability	***
Overall	***

Superstar Challenge

'Exciting' it says. 'Addictive' it says. It had better be good! he says, noting that we are off to a good start with the cover advertising it as being 'pure machine code'. Just as well because we don't deal with impure machine code in this magazine.

Does anybody out there remember Daley Thompson's Joystick Destroyer? This is in much the same vein except



that this time it is judo champion Brian Jacks who is getting the royalties.

The game is recorded at high speed on both sides because there is a second section on the flip side, this makes the major hurdle the loading time.

The title screen loads before the start of each half of the game which means that it takes a long time to play it all the way through, as you have to load it all twice.

Graphics on this aren't that hot. They are all in mode zero with the sort of animation that you get when doodling on the corners of a telephone directory. You usually find Brian and you slogging it out, with Brian showing no spurts of speed.

The plot is very simple. You wiggle the joystick back and forth at a rate of knots, and the character on the screen runs, paddles or cycles faster. The only exception to this is the archery bit. This is a moving target and you control the angle and time of release of a crossbow bolt - with the fire button only. This is very much a shot in the dark until you get the hang of it, then it becomes routine.

Now for the other side of the tape.

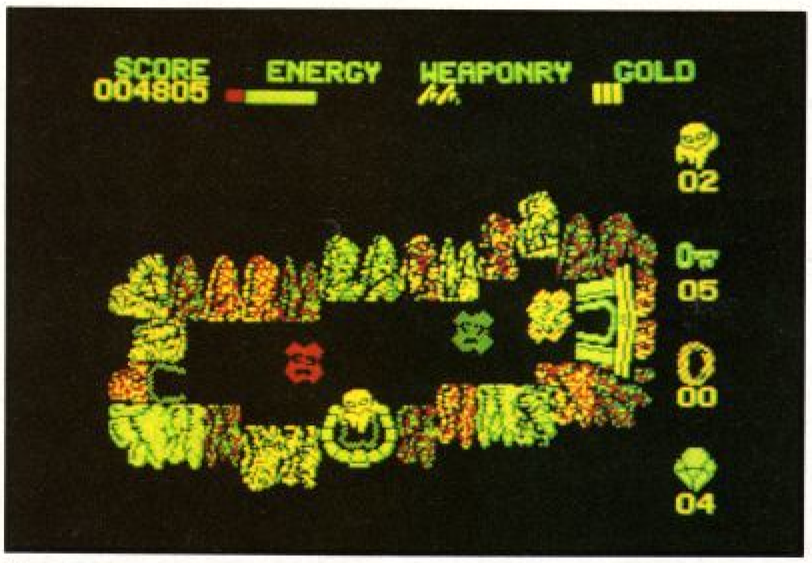
Swimming is the next event. How do you swim with a joystick? Apparently you wiggle it and press the button on top when you want air. Lack of air slows you down a bit but I never did manage to drown. Doubtless I will get more encouragement from Martech later on.

By this stage, your hand will have Space Invader's thumb and the joystick will be rapidly acquiring plastic fatigue. The brain desperately wants something exciting and it gets...squat thrusts. Be still my beating heart.

There are a few other events with much the same track record and they all involve you rattling your joystick or wrecking the keyboard. This is not as exciting as the Daley Thompson version and seems to be trying to run on a non-existent wave of fame.

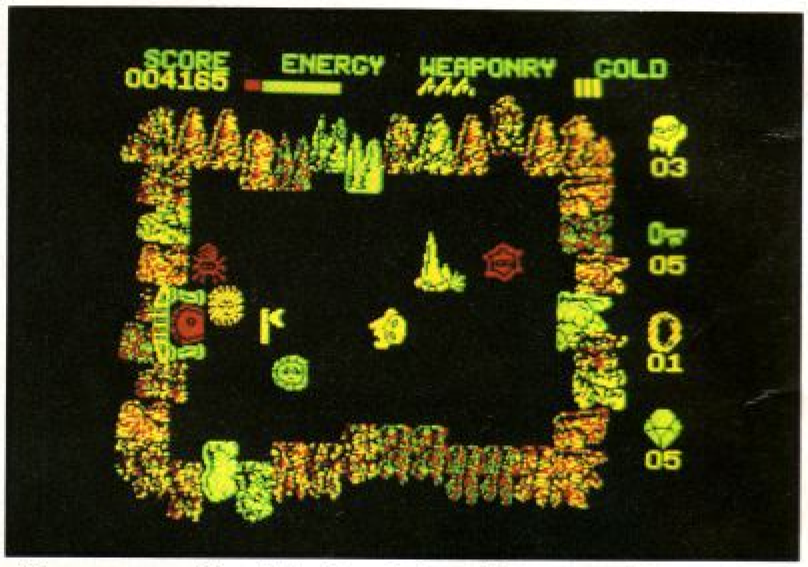
Author	Martech
Format	Cassette
Price	£7.95
Graphics	**
Playability	***
Addictiveness	**
Overall	**

Wizard's Lair



The idea of this game is to guide 'Pot-hole' Pete around 'a massive subterranean network of interconnecting caves, rooms, and passages'. So now you know as much as I do about the plot. Oh sorry - you do have a reason for doing this; you must collect four pieces of 'The Golden Lion' which somehow will help you escape, whereupon you presumably sell the Golden Lion for a vast amount of money, or perhaps not.

If Bubble Bus are after an award for best original game design they are not going to nominate this title. The scenario and gameplay are so close to the Spectrum classic 'Atic Atac' from Ultimate that the casual observer would be forgiven for thinking that this was a conversion. A second glance would prove him wrong. Ultimate would have done a better job.



The game works with a joystick and the cursor keys, which, although they are not the easiest keys to use, are better than some games which don't allow use of the keyboard at all. You can also use the keys to which the joystick is simultaneously mapped, but as these are even worse than the cursor keys and I don't really suggest you try it. Unfortunately, this lack of attention to detail runs throughout the program and leaves you wishing the author had taken a few more days and tidied things up.

My first gripe about the game is the dirge of a tune that greets you after you wait an age for it to load at SPEED WRITE 0. This does not bode well for the rest of the sound in the program and in fact all the sounds in the program are worse than in the Spectrum version of the game this was converted from. It also stops completely sometimes and the game freezes for a second, presumably because the sound buffer isn't being flushed properly.

The second thing that spoils the game is the graphics. In the Spectrum version you of course had eight different colours on the screen, but because the game is in mode 1 (to be as similar to the Spectrum version as possible) you can only have four colours. What do you do? Well, you choose your colours carefully and with clever use of stippling you can get what seems like more than four colours out of the machine, e.g. red stippled with yellow would give a passable orange. It can look great, look at those fantastic screen pictures drawn by Jill Lawson in back issues of this magazine to see how effective it can be. Unfortunately that is NOT the case in this game. The author seems so have chosen a random number and XORed it with the graphics (read your manual) before printing, resulting in striped, speckled and blotchy characters and horrible surrounding graphics. Almost anything would have been better, even only three solid colours (and black) on the screen, or each screen having different combinations of the 27 available. This looks bad even on a green monitor.

Those gripes aside, how does it play? Well, after pressing

the Enter key four times it finally starts (this is not always the case - most times only two will do). You run around a quite detailed little landscape from where your view of Pot-hole Pete is of the top of his head (although all the other characters are side on), and you fire spinning axes at the other characters who are determined to finish you off. Some of them are immune to your weapons and fire back. There are various things around the place that will replenish your energy, give you more weapons etc. and bits of treasure.... and of course somewhere there are four bits of the Golden Lion. Yet more gripes: firstly if you watch the Energy bar, although its general direction is towards zero, it is not altogether sure it wants to go there and it flickers up and down the scale while it tries to decide. When you collect a Spell and you haven't got enough gold to allow it to work, it tells you with a very noisy, flashing message for much too long, and ignores all my pressing of the keyboard to tell it that I have read it and want to get on with the game. You get a similar problem when you run out of Energy. The game stops and the word ENERGY flashes and screeches at you for what seems like ages, and the first few times you think it is just warning you that energy is low and you wish it would get on with the game so that you can top it up.... then it goes and kills you! These last two things do not exactly help you to 'get into' playing the game.

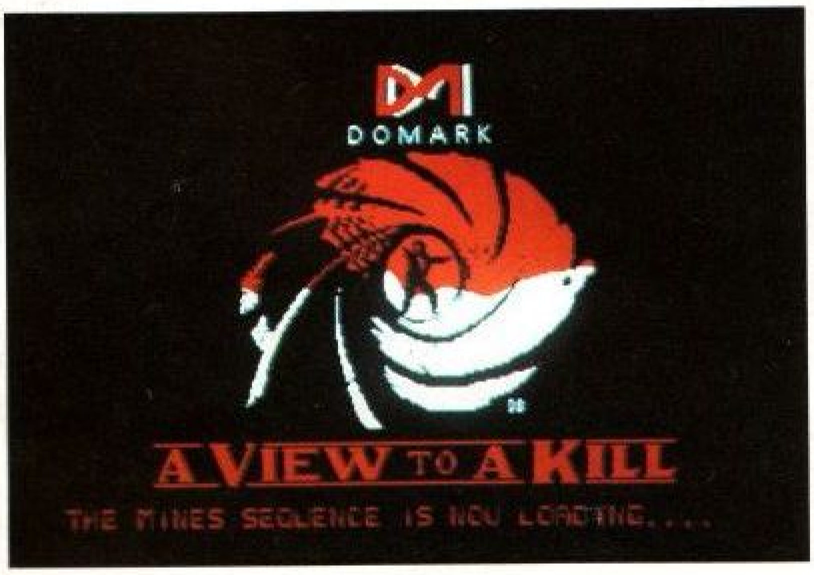
Despite these problems I began to like it for the type of game it was, and ignored its limitations. If you want a mapping type game where you run around mindlessly killing things but with a bit of strategy involved in working out where your next batch of weapons is coming from, and avoiding the creatures that fight back, then you might enjoy it, and there is as yet nothing similar on the Amstrads.

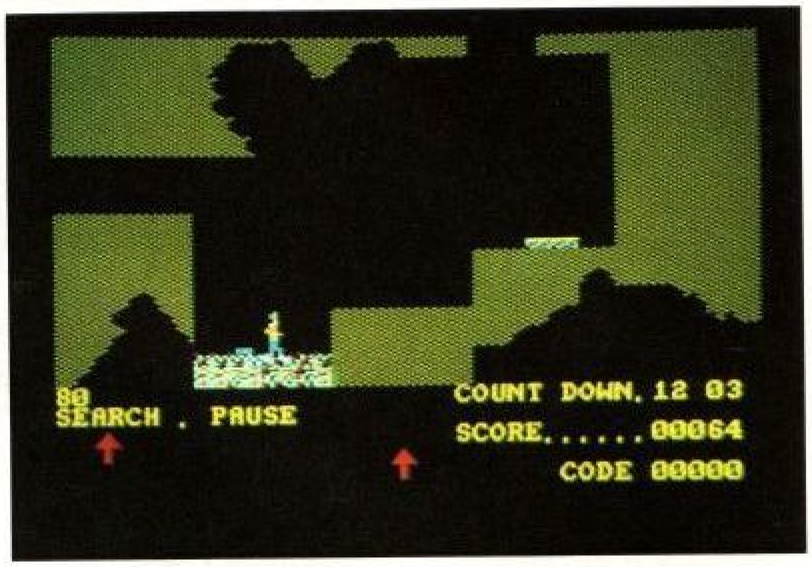
Author	Bubble Bus Software
Format	Cassette
Price	£7.95
Graphics	**
Addictiveness	**
Playability	***
Overall	**

View to a Kill

This is a game of many parts. Well, three anyway, so get yourself a drink and sandwiches, this is going to be a long review.

You take the role of 007 himself, James Bond. The game





loads up with the famous view down a gun barrel and heralds itself with the Duran Duran theme tune. It then gives you the option of playing one of the three parts of the game. It is possible to play them in any order, but unless you complete them properly, you do not actually score anything.

The first game loads up and plays the Bond theme which, curiously, the other two don't. Then it is the job of superhero 007 to go on an un-guided tour of an unstable mine in Silicon Valley which contains an even more unstable bomb. The hazards you encounter are nothing compared with the number of times you can cause crashes. Honestly, this game has more bugs in it than the whole of the KGB. The problems centre around a grappling gun. If you use it while you are lying down stunned, a ghost Bond is formed standing by the rope. Furthermore, if you do a heroic swing from the grappling rope into the next screen, you find yourself hopelessly embedded in the scenery (Tarzan never had this problem). It is also possible to drive the lift off the screen and into the memory of the computer - not very clever. I spoke to Domark at the PCW show and they promised to do something about it.

You stun yourself by falling from a great height and hitting the ground with sickening thud. After which, you feel a bit washed out. When you have dragged Mayday out of the mine, you are given a codeword which lets you into the second part of the game. I didn't get it but you can play on without getting a score for your troubles. The 'Now stop your cassette' messages smack too strongly of a Spectrum conversion.

When you get to the second game (the bit in the multi-storey building if you have seen the film), the graphics look vaguely familiar. Apart from the fact that time is now being measured by a burning building and you are running through rooms instead of caverns, not a lot has changed. You still can't drop more than one thing on a screen. About the only new touch is that you need to open cupboards to retrieve objects. This process requires a key and doesn't actually show you an open cupboard or an object when you are done. To get the object you must look again. Technically, this is known as a cop-out.

I have the sneaking suspicion that sometimes this section of the game is impossible to complete but I never managed to complete it under favourable conditions anyway.

Now for the Paris car chase.

This does use different sprites and graphics from the previous parts and has you driving about Paris in your car, without attracting too much attention from the French

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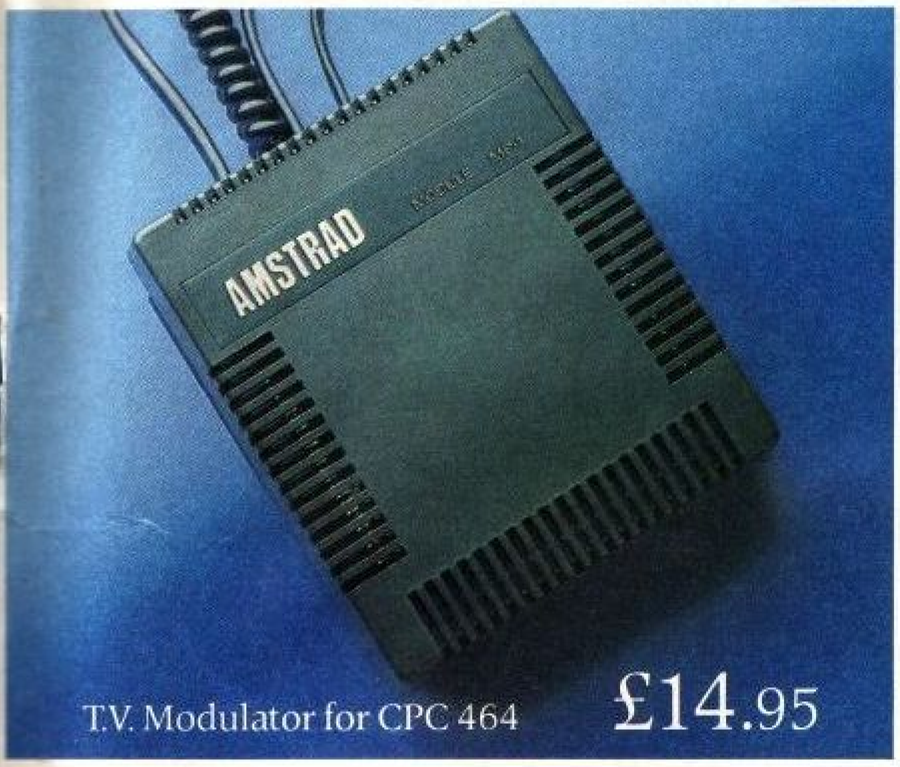
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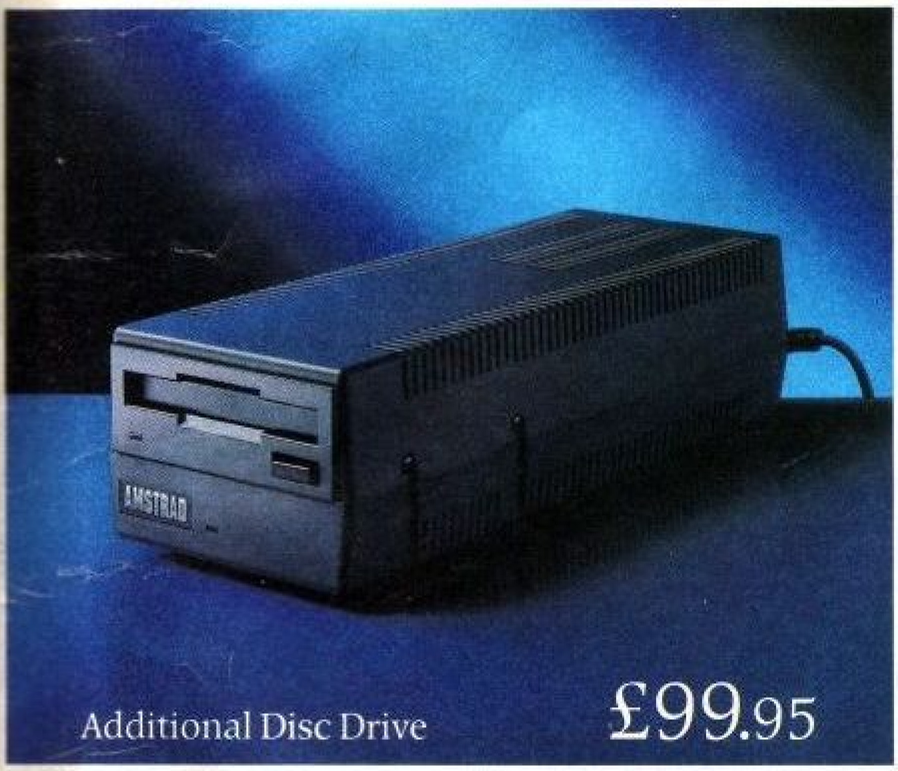
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police by, say, crashing into them. The reason for this is that Mayday has just jumped off the top of the Eiffel tower. Being a smart girl, she remembered her parachute and is in the process of falling to Earth. With any luck she will not miss and you will follow her about and be at the landing site to pick her up won't you?

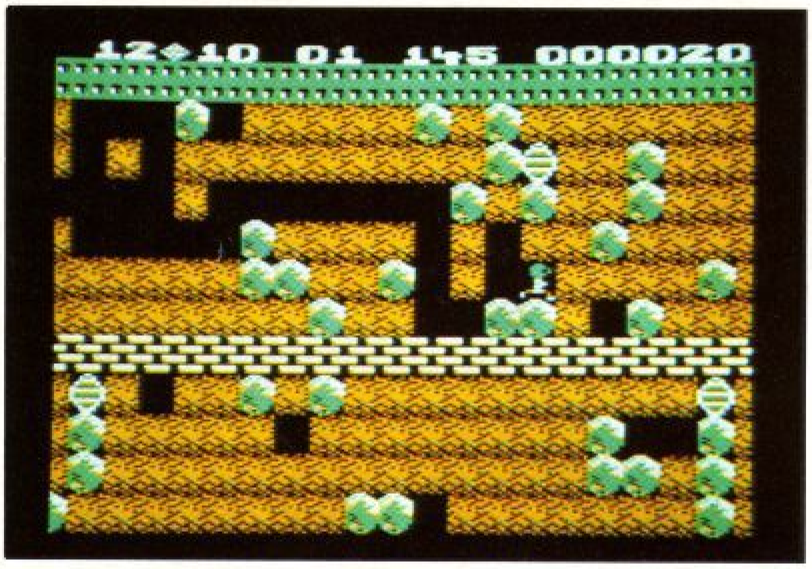
Unfortunately, the French are the worst double-parkers in the known universe and a lot of time is spent dodging cars and consequently extracting yourself from the side of a building. One bug here: I managed to get my car completely stuck by ramming another car at an angle and going into the side of a building simultaneously. Don't ask me for a lift.

Try as I might, I couldn't get onto the launch site to meet Mayday. The car kept on bouncing off, but then, I'm a lousy driver anyway. This means that I didn't finish this bit either.

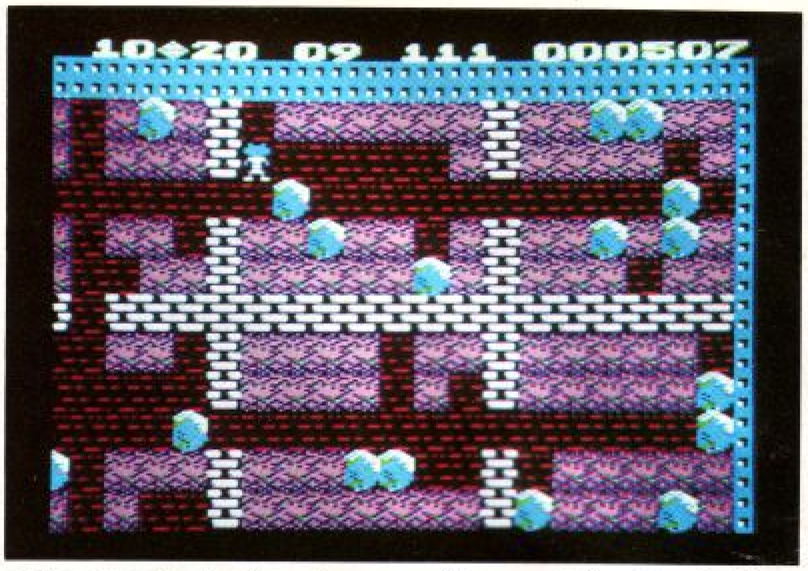
This game certainly gives you something to keep trying at, but whether it's skill or bugs I'm not quite sure.

Author	Domark
Format	Cassette
Price	£10.99
Graphics	**
Addictiveness	***
Playability	*
Overall	**

Boulder Dash



There is nothing new under the sun. Every week a software house produces a new game claiming that there has never been anything like it before. I suppose that the ideas, like old jokes, must originate somewhere but most games can be likened to a predecessor. In the case of Boulder Dash, its ancestor is the Dig Dug arcade game. The nearest game to Boulder Dash on the Amstrad was Fruity Frank. The plot is fairly simple, you play the part of Rockford, an insect like man. To score points you have to run around a selection of mazes collecting jewels. The mazes consist of soft earth which you can dig through, and solid walls which have to be circumnavigated. Impregnated in the earth are the precious jewels and worthless boulders. You may stand below them but if either of these objects should fall on you, you lose a life and go to the start of the screen. As you progress onto the later screens it is important that you learn the rules which govern the way in which boulders fall, so that you can leave the way open to the jewels. Once the required number of jewels have been collected, you can make your way to the



exit and collect a time bonus or the remaining jewels for a further bonus. On later screens more hazards appear.

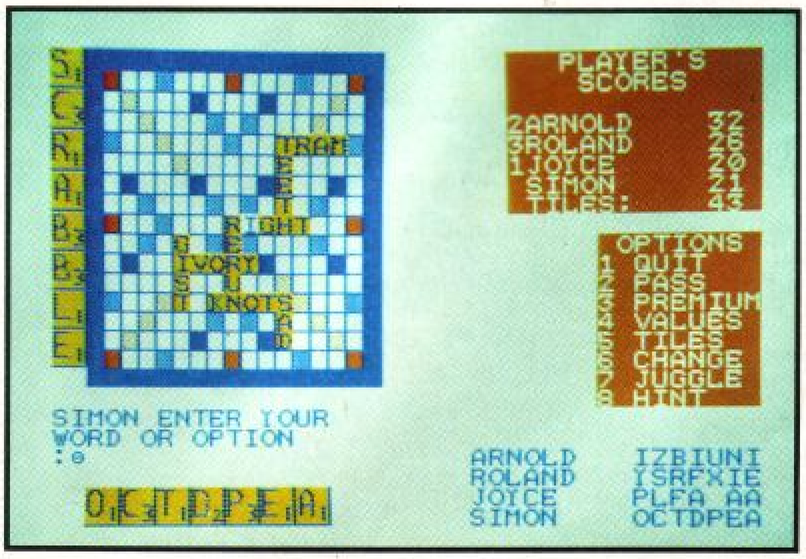
The first major hazard is a butterfly, this appears on a screen where there are no jewels to collect, they have to be generated by dropping a boulder on a butterfly. This is made extremely hazardous by the butterflies' ability to kill you on contact. All the butterflies have to be squashed before you can exit the screen, simply releasing the creature allows it to roam around the perimeter of the earth which has been dug away. Usually it will catch and kill you.

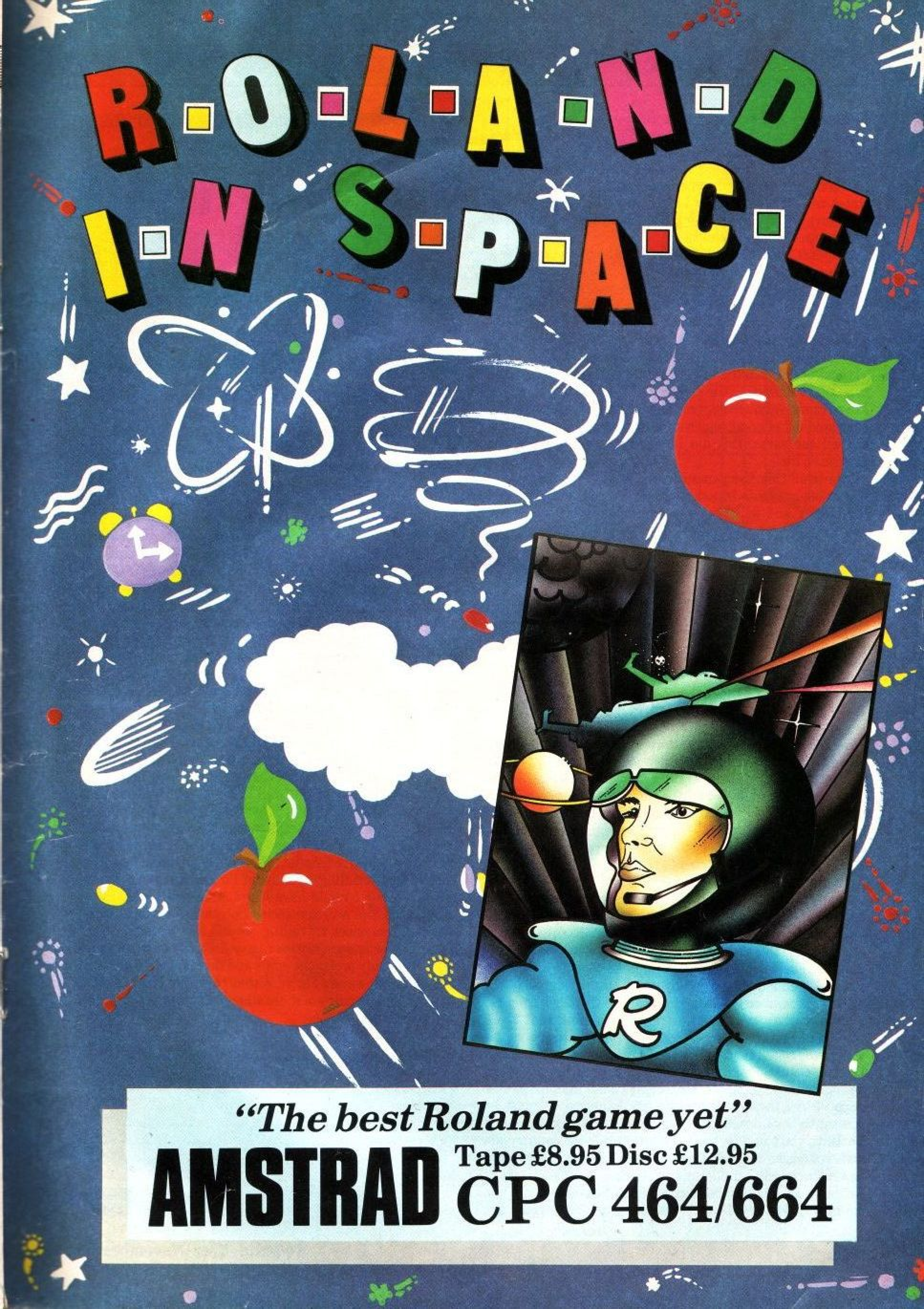
Fireflies are glowing square blobs, they have a more predictable movement pattern but move very much faster. To get to some of the latter jewels it is necessary for you to construct a garden path to lead them down, and then slide in behind their backs and take the treasure. The host of nasties continues: a growing amoeba and an enchanted wall. The game is beautifully written, the scrolling is rapid and smooth, and the animation realistic. There are plenty of little touches such as multi-coloured blocks which scroll within themselves at the beginning of each screen.

Boulder Dash is incredibly addictive, the strongest 'Just one more game and then I'll finish' I have ever come across.

Author	Mirrorsoft
Price	£9.95
Format	Cassette
Graphics	*****
Playability	****
Addictiveness	*****
Overall	*****

Scrabble




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Leisure Genius Scrabble is a computer version of the best-selling and almost cultish board-game with the added advantage that you can play against the computer. This is great if you can't find a partner and a good way of looking at the computer's built-in dictionary. The documentation states that there are over 11,000 words whereas the box states over 12,000. Whatever the number, the program loads in a very acceptable 5 minutes.

Computer Scrabble first appeared on the Spectrum over a year ago and I have been waiting with bated breath for the Amstrad conversion. The program's parentage is obvious as it uses a Spectrum type loader (lots of flashing lines on the screen) and they have also decided to re-define the perfectly readable Amstrad characters to match the less readable Spectrum set.

I thought the graphics were certainly less inspired than the original, the amazing tile juggling and placement sequences are missing. Admittedly, graphics are only the icing on the cake, and not of great importance in a board-game like this, but all the same, this did blunt my appreciation of the program a little.

Despite all this, the game will sell in vast quantities as it has in its previous incarnations. It is both addictive and frustrating and will keep you amused well into the early hours.

Author	Leisure Genius
Price	£12.95/£9.95
Format	Disc/Cassette
Graphics	*
Playability	**
Addictiveness	*****
Overall	****

Southern Belle

I can understand flight simulators, I can understand driving simulators, but one begins to wonder why anyone would want to simulate a steam train. I know that all school boys grow up with the desire to drive steam trains, or they did in my day, but I don't know if the that feeling of excitement can be simulated in your own living room. Having said all that though, I have to say that I quite enjoyed my trip from Victoria to Brighton, even though I arrived 11 minutes late (who said it wasn't true to life?), having run out of coal and water about 4 miles from Brighton and coasted into the station at a leisurely 7 miles an hour. I only tried the program on a training run, but was in full control. Fortunately, this did mean that I only had to stop once (at Brighton) as I don't think I could have coped with all the stopping and starting on a full run. Those of you, who like myself, remember Frankie Howerd and the Girls from St. Trinian's when they stole a train, may think that there wouldn't be much to simulate - how wrong could you be - as well as the regulator (throttle) and brakes, one has to control the cut off (% steam used), blower (in tunnels and when de-regulating), damper (air supply) and injector (water supply). All these are precariously balanced so must be constantly monitored. The screen shows the gauges and knobs as you stand on the foot-plate, while the countryside and landmarks of the South Downs rush by (meander might be a better word). An old, railway style clock gives a constant reminder of how far behind schedule you are, while the ominously low levels of remaining coal and water are



also shown along with your speed, which can easily exceed 70 miles an hour on the downhill sections. The track gradient can also be shown at the touch of a button as can the current distance from and to London and Brighton. The train starts, naturally enough, at rest in Victoria station, where one turns the cut off to full and regulator to the half way point - not forgetting to sound the whistle before pulling away. Slowly but surely the train pulls away from the confines of the station and builds up speed as it passes over the Thames and past the old Battersea power station; the famous old landmark being drawn in wire frame 3-D with hidden line removal. A little further down the line we reach the first station, Battersea Park, followed by that travellers' nightmare, Clapham Junction. By now the regulator is fully opened and the cut off reduced to save steam. Every so often the fire box doors are opened so that a little more coal may be shovelled onto the glowing fire. The rate of water injection being set to keep the water level to about the three quarters filled point. The damper is adjusted to keep the smoke to a consistent grey plume while the fire doors remain closed to build the heat of the fire. The train continues up the steady incline towards Quarry Tunnel, about 17 miles out, which marks the top of the climb, the train may now accelerate quite considerably down hill and so on to the final destination. I don't know what to make of this program, by the time I was nearing Brighton, the tension caused by the impending exhaustion of my coal and water supplies was quite great and yet for a lot of the journey I seemed to have been rather twiddling my thumbs. I'm sure that on the more difficult levels I would have found more to do, but at first appearance, the program seems to be more aimed at those who can remember travelling on this sort of train rather than those who can only ever have dreamed of it, and who would probably prefer the spills and thrills of a car or flight simulator. However, I'm sure that this simulator is more true to life than many of those other genre, but perhaps that is also its major failing.

Author	Hewson Consultants
Format	Cassette
Price	£7.95
Graphics	***
Addictiveness	****
Playability	***
Overall	****

ACU

The Unsung Heroes (3)



Ivor Spital, Chris Anstey, Gill Stevenson and Roland Perry

By Ivor Spital (and friend!)

The original 'Arnold'

In the summer of '83, soon after Chairman Alan Sugar decided that there would be an Amstrad micro, a Commodore VIC-20 arrived on my bench in the Amstrad laboratory. Wow! a computer (...at least I thought it was at the time), and, as is usually the case when it comes to prospective Amstrad products, the competition was wheeled in to be assessed. As there was nobody within the company (myself included) who knew anything at all about computers, a coin was tossed, and I was charged with the not unpleasant job of finding out what you can and can't do with such a machine. Up until this time, Amstrad had forged a considerable niche for itself in the inexpensive hi-fi, TV and video market, with the occasional, though nevertheless profitable, sortie into the world of 'five minute wonders' such as CB radios or those great big headphones with sliding bass and treble controls (...remember those?). I must admit to having wondered at the time whether home computers would be just another of those passing crazes.

Anyway, mine is not to question the boss, and my first involvement with the Amstrad computer followed a telephone call from project leader Roland Perry (of Ambit International) about setting to work converting some fifty Amstrad portable colour tellys into RGB monitors.

Roland Perry

In the two or three months preceding this, much dirty work had been afoot in Brentwood. Ambit International had previously performed occasional development work for Amstrad, but when approached in the middle of the annual stock check (up to his ears in print-outs from his 'official' job of DP Manager) Roland realised that this was 'The Big One'. To complete the design in around three months was indeed a tall order, but he agreed to do a lightning feasibility study.

Two well-known design houses in Cambridge were approached and both declared the task impossible! Part of the problem was that Ambit was not allowed to mention the Amstrad name - our involvement in the personal computer sector was a 'state secret' until the end of the year, and only then revealed under a non-disclosure agreement. In addition, both houses were very busy for Sinclair Research and Acorn, and did not relish the extra work.

Meanwhile after a few late nights in 'The Swan' in Brentwood High Street (the blueprint for many more nights to come) and a trip to Dorking, the now famous dynamic duo of Locomotive and MEJ - both eager for extra work and keen to rise to the challenge - collaborated to produce a final specification which was delivered to Amstrad in downtown Tottenham only ten days after the intial contact with Ambit. Work began immediately, with Ambit playing the role of project manager, arbitrator, and general co-ordinator. Roland Perry dealt with all technical matters, supervising the design, and most importantly, enforcing the schedules, while William Poel began the task of convincing software houses to convert games for 'yet another micro'!

Roland was soon to fly off to the Far East (together with Mark Jones and Amstrad's Technical Director Bob Watkins) to consolidate matters with the chip manufacturing giants and Amstrad's production plant out there. They took with them a couple of prototype computers (the hardware design was finished, with a special gate-array simulator replacing the ULA) sporting an early version of the software. Meanwhile, Locomotive Software were putting the finishing touches to the now renowned BASIC and operating system. Things were moving.

By now, the computer had become affectionately known as 'Arnold' (an anagram of Roland), and the first prototypes, in a drab beige and grey livery, began to appear around the company. Chris Anstey joined the team at that time, assembling and testing protypes at Ambit. Many of these early Arnolds are still in fact giving faithful service deep within the bowels of Amsoft.

We were now approaching the winter of '83. The computer would be launched in April of the following year and Amstrad was anxious to establish a reasonable software base at the outset, aiming for about fifty software titles to be available at launch. Fifty prototype Arnolds were therefore made (to go with the fifty tellys converted to Roger Hurrey's design, which was also used in the CTM640), and the photocopier churned out fifty BASIC and firmware specs...

The Amstrad computer was ready to be unleashed into the seedy world of software houses whose cages had already been rattled in William Poel's inimitable style.

A couple of capable co-ordinators were called for. Enter Sally Tyler and Gill Stevenson, two of the original 'mob' who formed the nucleus of Amsoft, a division of Amstrad that Alan Sugar established to look after all the peripherals and paraphernalia that was bound to surround a major computer launch. Based in a tiny office on the first floor of Ambit, Amsoft started sending out Arnold kits like undercover envoys posted from HQ. It was all understandable really -secrecy and confidentiality had to be maintained for us to steal the mark on our competitors, and as the first of the games' software began to emerge, Sally and Gill drove madly about trying to retrieve finished-with Arnolds from some reluctant software houses.

During these early days, Amstrad were offering £50-a-bug to anyone who could find a major boob in Arnold's BASIC or operating system, and it was to the designers' credit that nothing was paid out and that we are still shipping the original version of the ROM in the CPC464. Throughout this period, Karen Russell from the Amstrad drawing office ferried components, drawings, and prototypes to and from Brentwood, visting the Ambit office mysteriously at crack of dawn, earning her the nick-name 'The Arnold Fairy'.

There was a deadline for the ROMs in order to mask them in time to fit to the first production units. When this milestone had successfully come and gone, Locomotive Software set about writing the firmware manual, while Roland, with artistic help from Sally, retired home (there were too many people in that small office by now) to write the Welcome tape.

The next major job was writing the instruction manual. (Why doesn't anyone ever start the manual before the software is finished?) A lot of thought went into just what type of book it should be; what sort of tone it should take with the readers. Should it assume that the user is an absolute wally? (like some books did), or a doctor of computer science? (like others did). Naturally enough we opted for a plain language manual with some sections for the beginner and some for the more advanced programmer. The eloquent William Poel brought to bear his years of editing experience, and, chapter by chapter, the book began to take shape. Joint proof-reading sessions through the night became regular occurrences, sustained by periodic injections of hamburgers from the local take-away and coffee and doughnuts for breakfast in the morning, all cheerfully provided by Sally.

Meanwhile, as Roland and William were dedicating more than half of their 90 hour working week to Amstrad, they agreed to part company with Ambit and seek their fortune with us. A search for proper premises was thus embarked upon, and a straw poll of Amsoft employees showed that as all but one (William was a mile away) lived within half a mile of Brentwood station, that was obviously the place to be. Investigation of Brentwood House was so promising that the whole of Amstrad decided to desert Tottenham and move to Brentwood (also much nearer our Shoeburyness factory).

Considerable refurbishment was required, so Keith Collins (a frustrated architect) became building manager and (together with the rest of Amsoft) helped unblock the drains and keep the fort until we all moved in to join them. Amsoft were rapidly outstaying their welcome at Ambit; with every day that went by, more staff defected (never mind being poached from the Swan!), and in any case, Amsoft had worn out Ambit's photocopier. So at the last moment, minutes after finishing the manual, Amsoft departed to camp out among the builders, decorators and carpet fitters; taking with them Ambit's now redundant typesetting facility.

Off-the-tool computers arrived in England in the smart black finish (with multi-coloured keyboard) that we all know and love. It was about this time that Alan Sugar polled his employees to try and find a good name for the micro. 'Arnold' was obviously a strong contender, and a few other anagrams and ananyms were proffered, but in the end, CPC464 was chosen for its universality - after all, 'Arnold' may have been Albanian for camel-dung!

So the CPC464 was ready for launch, and Amsoft re-orientated itself away from design and towards support.

William and Chris set up the fifth floor as the photographic, typesetting, and editorial section handling (amongst other things) the user magazine, software catalogues, and product documentation, Keith set about organising the user club membership and mail order, while Roland assembled a small army of software engineers on the sixth floor to take care of technical enquiries and further non-games software development. Two of his original engineers (ex-Ambit), Chris Honey and Chris Laing have since departed to form Honeysoft. Gill joined customer services specialising in computer enquiries, and the procurement of games software passed into the hands of Amstrad.

Spring arrived, and on 11th April '84, the press assembled in the Great Hall of Westminster School together with the namesakes of Einstein, Archimedes, Monet, Ravel, and William Shakespeare to witness the launch of the CPC464, to the accompaniment of specially written demonstration software from the '6th floor'.



(Clockwise) Archimedes, Einstein, Ravel, Shakespeare, Monet

The critical acclaim with which the computer was received is now legendary. The celebration in the Swan (where else?) is also legendary. Rave-review after rave-review followed, and the story of Arnold's rise to international fame and success in the tough, cut-throat world of home computers is now cherished history. ACU

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Related numeric field information may be totalised
Specific Numeric Field Searches offer conditions of less than/equal to/greater than (operands)
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Software by
Dialog ...

A Rom on the Side

Cliff Lawson examines two new sideways roms from Super-Power.

For over a year now, there seems to have been very little movement towards using the Arnold's in-built ability to address banks of sideways ROMs, then, all of a sudden, the market seems to be awash with them. First there came the excellent Arnor assembler which has been closely followed by offerings from Honeysoft, KDS and Micropower. A lot of this may well be due to the cost of blank EPROMS (Arnold is very particular about them having an access time of 200nS or better), the cost of 16K EPROMS is still quite high, even when bought in quite large bulk quantities and this perhaps explains the rather high cost of some of the add-on ROMS that have now appeared (both the Arnor assembler and the Micropower ROMs retail at about 40 quid). A second stumbling block in producing sideways ROMs is ensuring that the user has somewhere to put them - all the companies mentioned above have produced some form of plug-in ROM card, offering from 1 up to 8 free slots.

The eight slot card is being produced by Micropower (as mentioned in a previous issue), probably because they have at present the largest range of ROMs available. Their card comes pleasantly boxed in a case which matches the colour scheme of the 464 and internally the circuitry is well laid out, providing a very simple way of selecting ROM numbers for a particular socket. The actual circuit, however, is a little suspect and will cause problems if other rom cards (such as MAXAM) are present as well (see letter in September issue for more details).

It should be emphasised that their card is aimed very much at the 464 and will not even fit onto a 664 or 6128. This is just as well, because the majority of their software is not compatible with V1.1 firmware anyway (making use of a host of un-documented addresses to provide features such as forcing CAPS LOCK on which would not be possible otherwise. This is particularly true in the programmer's toolkit but may not be such a problem in the other ROMs). Already available is a competent mailing list program within ROM (though I would have thought that it may be a rather specialist sort of program to produce in a ROMable form). There is some talk of that old arcade favourite of theirs, 'Ghouls' being available in a ROM, however, I was unable to see a copy of it - the two reviewed here both fit quite nicely into the category of utilities ROMs.

Probably the most interesting of the Micropower ROMs is their Programmer's Toolkit. As the manual clearly states in its introduction, the ROM aims to do four jobs:

Provide the 464 with most of the V1.1 BASIC additions;
Add several very useful new commands to the BASIC;
Give BASIC programmers a collection of debugging aids;
Provide utilities (such as a UDG designer).

Although I had only a draft copy of the manual, it did appear to be quite a comprehensive introduction (not just a few scribbles on the back of an envelope as has been the case in the past for several computer products I've seen). The syntax of each of the 35 new commands is given, followed by a description of its operation and use. Thankfully, a number of examples that will hopefully illustrate anything the text has failed to fully describe are also given.

Features

One of the most useful commands is |COMMAND which will not only list the new commands, but can also give a reminder of the syntax of any individual one, especially useful when the manual isn't just to hand.

That old toolkit faithful - a REM remover is available under the command |COMPACT.

|CHARACTER allows user defined graphics to be easily edited on a full screen grid.

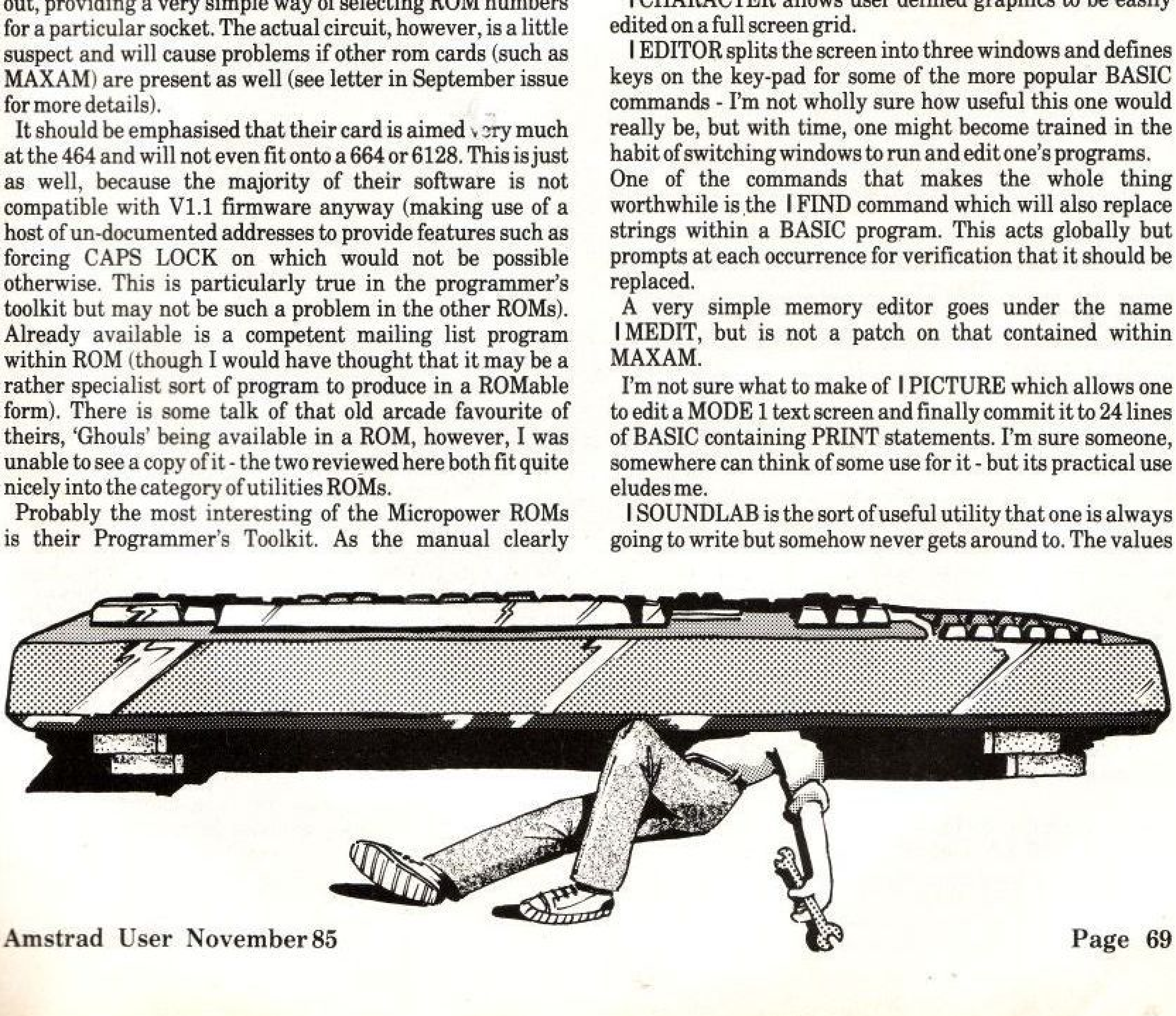
|EDITOR splits the screen into three windows and defines keys on the key-pad for some of the more popular BASIC commands - I'm not wholly sure how useful this one would really be, but with time, one might become trained in the habit of switching windows to run and edit one's programs.

One of the commands that makes the whole thing worthwhile is the |FIND command which will also replace strings within a BASIC program. This acts globally but prompts at each occurrence for verification that it should be replaced.

A very simple memory editor goes under the name |MEDIT, but is not a patch on that contained within MAXAM.

I'm not sure what to make of |PICTURE which allows one to edit a MODE 1 text screen and finally commit it to 24 lines of BASIC containing PRINT statements. I'm sure someone, somewhere can think of some use for it - but its practical use eludes me.

|SOUNDLAB is the sort of useful utility that one is always going to write but somehow never gets around to. The values



in either sort of envelope and all the SOUND command parameters can be easily modified and their affect heard by hitting the space bar - perfect when you're trying to create the right noise for the demise of your invaders or whatever.

| XREF will indicate all the lines that GOTO or GOSUB to a particular line, this doesn't exactly promote a structured approach to programming, but we've all needed to do this sort of thing at some time in the past.

The ROM contains two types of screen dump which can be used with either the dreaded DMP1 or a decent EPSON compatible, the | PRINTER command selects which will be used and | DUMP or | CDUMP pick either a straight monochrome dump or a shaded dump that goes some way to allowing colour displays to be printed on a single ink printer, though the aspect ratio of the dump does not appear to be the same as that of the screen, producing a rather elongated print.

All output to the screen can be echoed to the printer with the cunningly named | ECHO.ON (| ECHO.OFF cancels the effect). This would, for example, allow disc CATalogues to be printed.

The copious output of BASIC's trace can be directed to the printer using | LTRON. | LTROFF stops it.

One of the basic graphic commands that isn't present in Locomotive BASIC is | CIRCLE. This uses a particularly fast algorithm - though it isn't as smooth as some slower techniques.

664 Upgrade

The command that most people miss on the 464 which is available on later machines is now available using | FILL -unfortunately, this algorithm is not very fast, but benefits from the fact that areas are filled using the current line MASK, enabling easy stipple filling which can produce some powerful effects in only a couple of instructions.

As on V1.1, CALL & BD19 has been given the prettier interface of | FRAME to synchronise animation effects.

The setting of graphics paper and pen is simplified using | GRAPHICS.PAPER and | GRAPHICS.PEN.

The powerful V1.1 MASK command has been implemented in the shape of | MASK and like its namesake allows a binary dot pattern to be set up for line drawing (and area filling as mentioned above).

LOGO freaks (and DRAGON owners) can spend many a happy hour driving an imaginary turtle about leaving a trail. The | TURTLE command takes a string parameter which contains direction instructions of the F,B,L and R variety (for Forward, Back, Left and Right for those who hadn't already guessed). Though I was rather suprised to find that it will only accept upper case letters as command.

Picking characters up from the screen for collision detection purposes and the like can be achieved using | COPYCHAR.

The ESC control code that is usually ignored by Arnold's VDU can be used to switch on underline and/or double height characters, when followed by a second parameter.

Any odd graphic effects instigated by the new commands can be nullified using | NORMAL which sets things to just that.

Because some of the ROMs commands can produce more than a screenful of output (e.g. | COMMAND) and the [ESC] key does not pause output but terminates it, paged output can be enabled with | PAGE.ON and disabled with | PAGE.OFF - this will stop screen output every 15 lines.

The firmware allows either the memory at &C000 or &4000 to be used to hold screen info. - it is possible to switch between the two using | SCREEN -though this is unlikely to be very useful from BASIC as the latter of the two areas is where the middle of a BASIC program would usually reside.

Micropower's roots in the world of Acorn machines show with some of the ROM commands such as | VDU which does the same as PRINT CHR$() and | GCOL to set the graphics mode and ink colour.

High speed tape

To supplement the 464 tape/disc filing system, | BAUD will allow 3000 and 4000 baud saving as well as the usual 1000 and 2000 - This will, however, be driving the hardware outside its design specification and cannot be guaranteed to be 100% successful - particularly when transfering tapes between more than one machine.

| INFO provides tape/disc file header information that will be useful when attempting to transfer commercial software to disc from tape - | UNPROTECT will also help in this task -though it could also be used by unscrupulous people to steal software.

| CLEAR.INPUT flushes tha keyboard input buffer as on V1.1.

| ON.BREAK.CONT completely break proofs a BASIC program as V1.1. | ON.BREAK.STOP re-enables it.

| KEYBOARD allows the CAPS/SHIFT locks to be forced on or off.

Like the | TURTLE command, | TUNE also takes a string parameter, but it obviously contains note data rather than direction information.

Again, it is rather annoying that it will not accept lower case.

Sideways ROMs don't seem to be complete without some form of ROM cataloging command and this ROM is no exception with its | ROMS.

Safe to use?

Some of the commands in this ROM are a little suspect (especially, | UNPROTECT) and making use of undocumented features/addresses so as to make it incompatible with all models except the 464 is a little worrying. Please note all you people who complain about 464/664 incompatibilities, the incompatibilty is caused solely by the use of undocumented features and is in no way caused by differences in the documented firmware - as there are no major differences.

However, as a programmer, I would have to say that this is a very worthwhile investment - especially as Amsoft have no plans to make the V1.1 ROM available. One or two of the commands do seem a little esoteric but are balanced by those that are an absolute must (e.g. | FIND). £39.95 isn't exactly cheap, but does seem to be the going rate for a 16K sideways ROM and this particular ROM probably provides the best value for money of all the Micropower ROMs. The matching ROM card at the same price will make it quite an expensive buy for both items, but the card can then take another seven ROMs (though some other manufacturers ROM card could be used equally well and would avoid any potential addressing problems that this card may contain).

Disc utilites

The second of Micropower's ROMs that I had for review was their Disk (spelt incorrectly) User'Utilities. Unlike the other ROM, this is a foreground ROM, so that, rather than adding a number of commands to the on-board BASIC (or other foreground program) it takes over the machine completely having been started by the system extension | DP. One thing not made clear in the manual, though it may be in the ROM card instructions, was that on a 464 foreground, ROMs must be fitted contiguously from ROM address 1 - which means that in the eight slot card, the disc utilities ROM must occupy the first free slot counting up from ROM 1 (on the left).

You're perhaps wondering what use the ROM is anyway, well, anyone who has erased *.* when they really meant *.BAK is the sort of person who could find this ROM useful. Directory entries can be read in, modified and re-written to the disc so that erased files can be restored (they are not wiped from the disc by ERA, only the directory entry is changed). Formatting and disc copying without having to have a copy of your system utilities disc is another potential use for the ROM. Also, discs corrupted on only a couple of sectors that would be uncopiable could be restored by selective copying of the undamaged parts.

Having typed | DP, a menu providing ten options (1-9 and 0) appears. Several of these will perform a function then enter a standard editor so that sector information can be updated by the user. Option 5 at any time allows direct access to the editor.

The Options

Option 1 will read the directory sectors from a disc and place them in the editor's buffer. The bytes within an entry are briefly described in the manual - sufficiently for one to understand how the allocation unit numbers relate to physical tracks and sectors on a disc. By the way, if all this talk of tracks and sectors has already got you baffled, then don't worry too much -the manual is much better at explaining them than I am, besides which, anyone not familiar with such terms is unlikely to be buying a ROM to doctor their discs anyway.

Option 2 allows selective reading of sectors from a disc - the editor being entered once the sector is read.

Option 3 again enters the sector editor once a file has been chosen from the directory. Cursor keys are used to step onto to the next sectors that contain the file (even though they may not be contiguous - the allocation units being read from the directory entry).

As well as allowing one to read sector information, the contents of any banked ROMs can also be read into the editor - though update would obviously be futile.

Having edited some sector information that has been read into the buffer, its contents can be replaced on the disc using option 6. Used incorrectly, this could have disastrous effects on your discs - the manual does give a concise warning to this effect but this cannot be emphasised too strongly. Although all editing could in theory be reversed, one would have to keep an exact record of all changes made (or better still, a backup copy of the disc).

A quite passable Z80 disassembler can be called up using option 7 and will not only disassemble the contents ot a sector held in the buffer but could also be used to pry into other sideways ROMs.

A second, general, debugging tool is the search memory option 8.

Option 0 allows a choice of screen displays for the editor and also allows the colours used to be changed.

Second menu

Option 9 is really just an entry to a second menu of utilities that consist of:-

Number 1 provides a formatting program (though system format is not available) - unfortunately, this isn't too fast and is not helped by the graphic display of concentric circles as each track is formatted accompanied by a rising tone. This effect is a pretty gimmick the first few times but could become quite tedious.

Number 2 allows an equivalent of COPYDISC, again, a concentric circular display and irritating noise give an indication of how far it has got.

Number 3 is quite interesting, giving a sector by sector map of the disc showing which sectors are system, directory, used, unused etc.

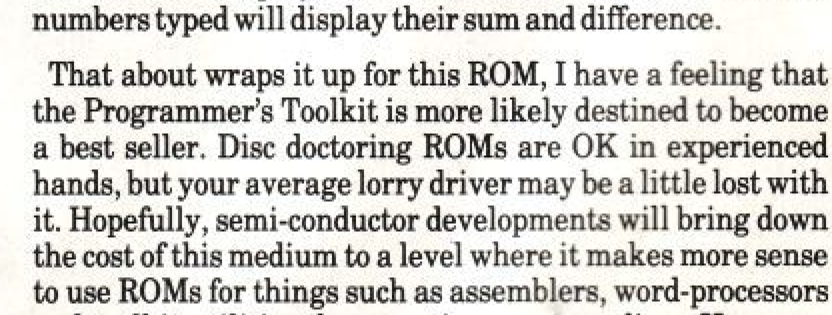
Number 4 is similar to 3, except that one is able to pick a particular file from a directory listing and then show its physical location on the disc in terms of tracks and sectors.

Numbers 5 and 6 perform a function similar to FILECOPY, allowing specific files to be read and written from discs. Areas of storage can also be saved in this way.

Number 7 allows one to enter external commands to start up a different foreground ROM (e.g. | BASIC would allow one to restart BASIC).

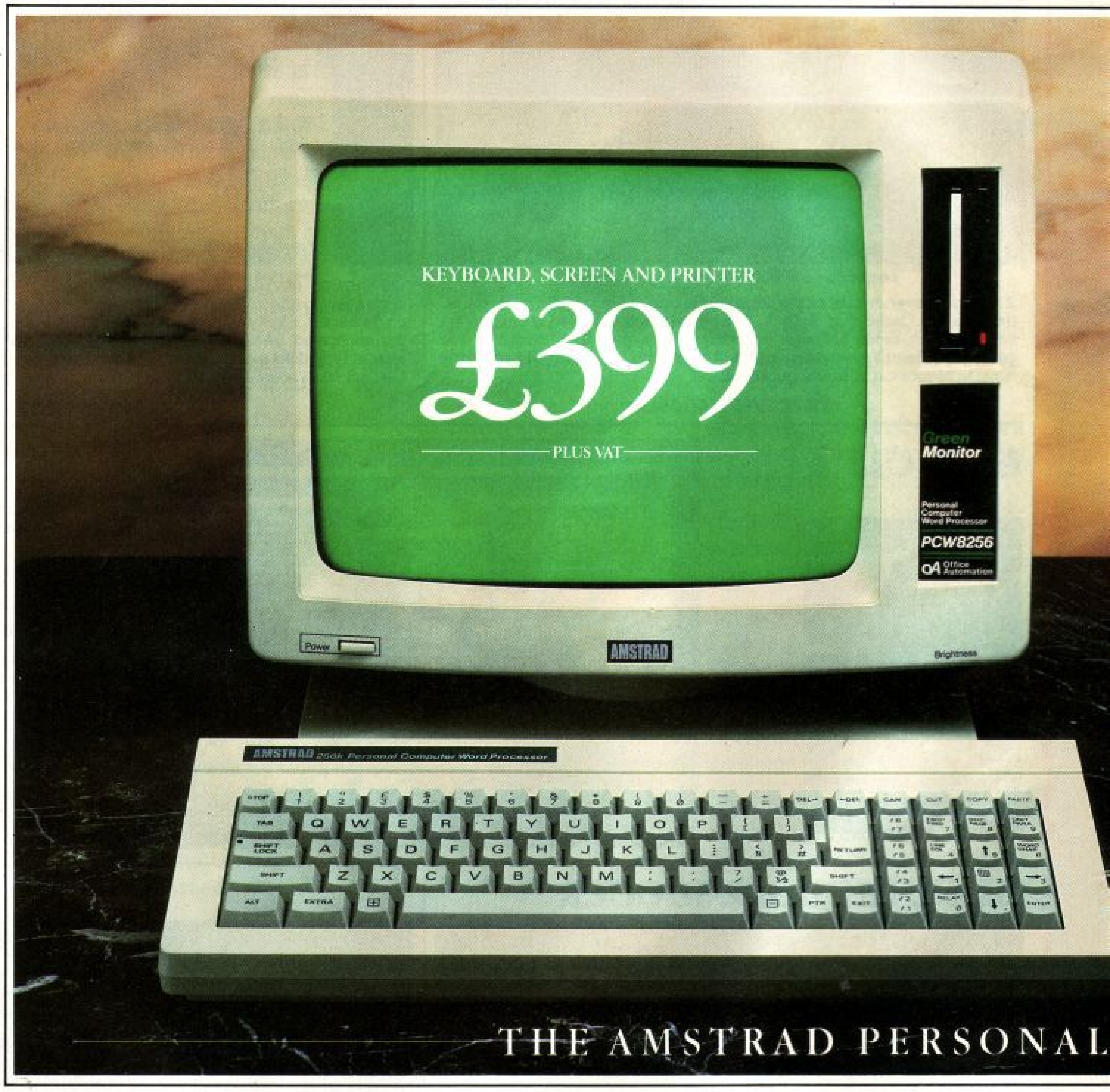
Number 8 allows a number typed in either hex, binary or decimal to be displayed in all the other number bases. Two numbers typed will display their sum and difference.

That about wraps it up for this ROM, I have a feeling that the Programmer's Toolkit is more likely destined to become a best seller. Disc doctoring ROMs are OK in experienced hands, but your average lorry driver may be a little lost with it. Hopefully, semi-conductor developments will bring down the cost of this medium to a level where it makes more sense to use ROMs for things such as assemblers, word-processors and toolkit utilities than wasting space on discs. However, there would have to be a quite drastic cut in the price before they could be used as a mass media device.



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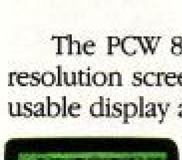


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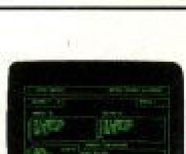
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The PCW 8256 is totally equipped for wordprocessing. It has a high resolution screen with 90 columns and 32 lines of text. That's 40% more usable display area than most PC's.



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BRUNWORD FROM BRUNNING SOFTWARE

INTRODUCTION

Brunword is now available for the Amstrad computer with many enhancements and new features. The programme is really two programmes in one - a powerful wordprocessor and a fast spelling test programme. And to cater for the odd secret or two, a security system is provided so that files can be encoded before saving to tape or disc.

SPELLING TEST

Teh spelling test routine is easily entered from the editor. A section of memory is permanently allocated to the dictionary which can contain about 7000 words due to a special storage technique. At the same time about 7 pages of text can be stored in the editor file area.

As the dictionary is in RAM the testing is very fast. A page of A4 takes about 8 seconds. Words are flashed onto the base of the screen as they are tested and the programme stops when the word is not in the dictionary. The word can then be edited, added to the dictionary or ignored. The programme is supplied with 4000 words in the dictionary.

WORDPROCESSOR

This is designed to be easy to use, easy to learn and yet is a comprehensive wordprocessor.

The text editor uses the delete and cursor keys as normal. The (SHIFT) and (CTRL) keys extend the cursor control to letter forward/back, word forward/back, line end/start, line up/down, scroll up/down, page up/down and reset cursor.

Text is entered using the 40 column mode and this, with the use of colour, helps to be much easier on the eyes. The text is typed in with the basic appearance that is required. Address on the right, "Dear Sir" on the left, "Yours sincerely" in the centre etc. When this is printed the programme works out how to maintain this same appearance for the different width enabling any width between 40 and 130 columns to be printed without reformating and with spaces added evenly to justify the text. (Punctuation then left and right). The exact print format can be seen in the 80 colomn mode.

The ESCAPE mode provides many facilities all based on key words. Cut and paste, move, find, block delete, and files can be saved on tape or disc but can also be temporarily stored in another part of memory enabling instant access to several files.

SECURITY CODE

You may want to keep a diary or have a secret recipe and this facility is designed to make access to the information virtually impossible without the code.

A security code up to fifteen characters long can be entered and then verified by typing the same code again. This code is used to encode all files that are saved to tape or disc. No record is made of the code to give high security.

COLOUR

The text that is typed into the editor is in yellow. Marked text is in red and can be block moved, deleted or saved. Programme menus, paragraph end markers and instructions are in blue. Special printer control instructions are in red. Pleasant to the eyes and easy to see at a glance what is happening.

PRINTER

BrunWord will operate correctly with any printer that connects to the printer port. The printer control codes can be set up for any printer and are saved along with each file.

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SUPERCHARGE

SUPERPOWER SIDEWAYS ROM CARD (Ref A101)

This unit opens up a whole new field of personal computing, previously only available to owners of the BBC Micro and other top of the range computers.

The SUPERPOWER Sideways Rom Card has the following features:

- Matching case, with easily detachable cover.
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- Bus extension for fitting of Disk Interface etc.
- Houses up to 7 Roms. (Foreground, Background & Extension).
- Any mix of 8K or 16K Eproms.
- No additional power supply necessary.

SUPERPOWER ROM BASED SOFTWARE

CURRENTLY AVAILABLE:

Programmer's Toolbox; Disk User's Utilities; Mailing List & Club Membership; Assembler, Disassembler & Machine-code Monitor.

COMING SOON:

Word Processor; Database....SEPTEMBER
Spreadsheet; Graphics/Statistics....OCTOBER

Rom-based Software has the following important advantages:—

1. Written in machine-code, it is very fast in operation.
2. Programs are instantly available from the keyboard.
3. The program code does not use RAM, thus permitting much larger files to reside in memory, reducing the number of disk accesses and saving time when manipulating files.
4. The program itself cannot become corrupted.

SUPERPOWER DISK USER'S UTILITIES (Ref A103)

Program allows detailed inspection and modification of information held on disk and is of particular use for recovering data from corrupted disks. Individual sectors can be read from and written to. All data can be output to the screen and/or printer. Program also contains a number of functions of use to assembly language programmers.

TABULATE DIRECTORY: Displays directory and enters EDIT mode. READ DISK SECTOR: Read sector and enter EDIT mode. LOAD DISK FILE: Load first sector into buffer and remainder to memory for fast access. Enter EDIT mode. LOAD UPPER ROM: Catalogues resident roms, prompts for rom selection and enters EDIT mode. EDIT MEMORY: Displays current buffer. Data displayed is Buffer Address, Hex and ASCII. Comprehensive editing facilities. 'COPY' key gives Intelligent Data Copy. 'TAB' key gives printer output. WRITE: Write sector to disk. DISASSEMBLE: Disassembles code from specified address, giving address, object code, menmonics and ASCII. Screen and/or Printer output. SEARCH MEMORY: Search sector or a complete file for ASCII string or series of Hex codes. UTILITIES: Includes Format, Hex/Decimal conversions, jump calculations etc.

SCREEN UTILITIES: Select from four display modes; choose background and foreground colours.

SUPERPOWER SIDEWAYS ROM CARD (Ref A101)



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Program handles thousands of name and address records (label and non-label fields). Twenty classification indicators make possible sophisticated selective examination, counting and printing of records. Alphabetical order is dealt with on data entry, allowing user to select 'key' word. Works with single and double disks as well as cassette.

Main Commands ...
ENTER: Data entry(*) GET: Load new file. COUNT: Selective Count. FIND: Find 'Name' or any String(*). LIST: List current file on screen (*). PRINT: Print label data or whole records selectively. MERGE: Merge and Sort files. SAVE: Write a file to disk or cassette. RESET: Reset colours, label sizes, class definitions, string constants etc.
(*Editing facilities available).

SUPERPOWER ASSEMBLER, DISASSEMBLER & MACHINE-CODE MONITOR (Ref A105)

This suite of routines represents the complete Development Package for the Amstrad Z80 programmer.

The assembler has a sophisticated text editor, a comprehensive set of options, is very fast and incorporates special techniques enabling large source files to be handled in memory. The full-feature disassembler produces files which can be edited and then re-assembled.

The Machine-code Monitor routines are extremely powerful, including the setting of conditional breakpoints (including loop counter option), single-step execution, alternative five column binary and mnemonic formats. Both sets of Z80 registers can be displayed.

Other options include Intelligent Move, Modification of code to run at a new address and colour selection of border, paper and pen.

SUPERPOWER PROGRAMMER'S TOOLBOX for the CPC 464 (Ref A104)

ADDITIONAL BASIC

TURTLE: Logo-like turtle graphics. TUNE: Output music string. CIRCLE: Draw a circle. FILL: Fill an area surrounded by foreground colour. GRAPHICS PEN/GRAPHICS PAPER: Set graphics and background colours. COPYCHR: Read a screen charter. ECHO ON/ECHO OFF: Printer output on and off. PAGE ON/PAGEOFF: Paged screen output on and off. CLEAR INPUT:— clear input buffer. (+extra graphics commands).

PROGRAMMER'S AIDS

EDITOR: Gives 2 additional windows for program editing. FIND (& REPLACE): Find a string and optionally replace. XREF: List references to particular line numbers (GOTO's, GOSUB's etc). COMPACT: Remove REM statements. FRAME: Synchronise screen update with frame fly-back. PRINTER: Epson-compatible or Amstrad printer for dump routines. FDUMP: Fast two-tone screen dump, with user-definition of 'pen' and 'paper'. CDUMP: Shaded screen dump depicting up to 9 colours. PLOAD: Load program saved under 'P' option. INFO: Give details on specified disk file. MEDIT: Comprehensive HEX and ASCII memory editor. LTRON (LTROFF): Send TRACE output to printer. HELP: List commands, functions and their parameters

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YOUR AMSTRAD.

SUPERPOWER WORD PROCESSOR (Ref A106)

This program incorporates the most useful facilities offered by the best Word Processors currently available on the BBC Micro and other up-market Home Computers.

Text Entry/Editing. User choice of 40 or 80 column mode. Document formatting achieved through use of embedded commands. Text can be formatted and justified on screen, if required. Find <and Replace>with 'wild-card' option. Word count, character count and page numbering reported.

Formatting. Multiple rulers are provided, allowing sophisticated layout of documents e.g. different combinations of TAB stops at different points in the text. All the normal controls are available e.g. page lengths & width, margins, indents, tab stops, justification, headers, footers etc., together with output of control characters to the printer.

Virtually UNLIMITED Document Length. The disk routines in the program handle multiple data files representing parts of a total document, with loading and saving carried out automatically.

Simple Calculator. A calculator window can be called to carry out simple arithmetic calculations. It is also possible to embed a calculation in the text, with the result being calculated and printed on output.

Data Exchange. As part of an integrated suite, the program will be able to handle ASCII files originating from the Spreadsheet, Database and Graphics/Statistics Packages.

Disk/External Commands. Direct Access available.

MANY MORE FEATURES. Ask your dealer for information.

SUPERPOWER DATABASE (Ref A107)

This menu-driven program has been designed to be the most comprehensive and flexible Database which can be achieved in 16K of machine code. Of special note are the PROCEDURES which have been implemented, enabling the more advanced user to write simple structured programs to manipulate the database information in order to meet his more specialized requirements. Databases need not be limited in size since the program contains routines for multiple file handling.

Field types — alphanumeric, integer, currency, floating point, logic, calculated and date.

MAIN FILE COMMANDS
- Create/Modify database structures, reports and procedures.
- Create ASCII file from a Database, enabling data to be passed to the Word Processor, Spreadsheet and Graphic/Statistics programs.
- Copy data to new Database.

RECORD EDITING
- Add, amend, delete, insert, view and duplicate.
- Search and Sort. Due to intelligent file structure and the indexing system adopted, both SEARCH and SORT are extremely fast.

REPORTS
Standard — selected fields may be output, together with totalling on those nominated. (Value fields only). Screen or printer output.

Labels — user-selected fields for printing. User-defined label size, number on sheet etc.

User-defined — user created report-format, combining entered text and designated fields. Editing and storing facilities.

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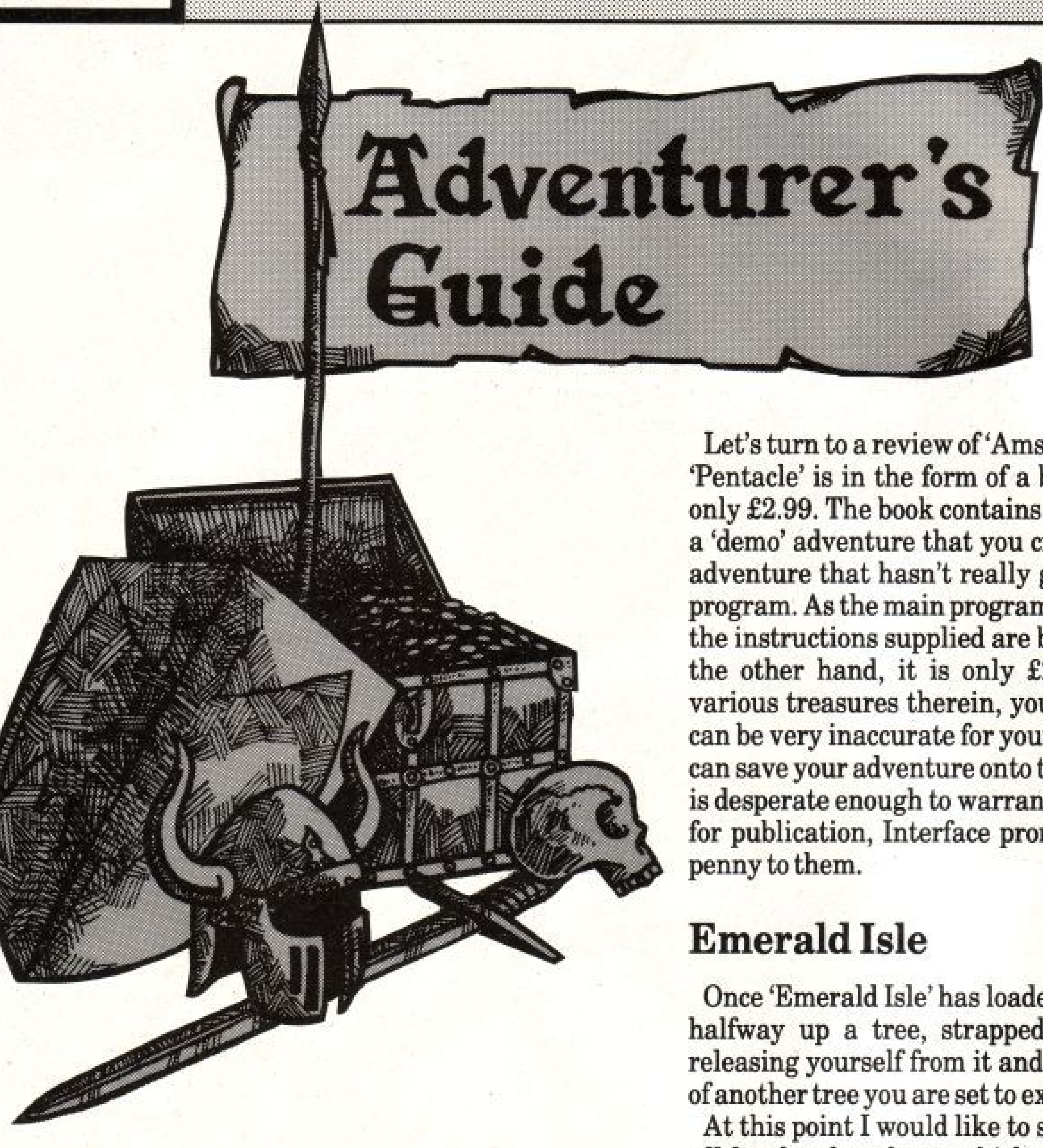
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SUPER POWER

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...SE OF YOUR AMSTRAD.



Welcome back to the Adventure Column. To begin with this month, I'll answer Dene Watkin's of Powys question on Interceptor's 'Jewels of Babylon'. He wants to know how to get past the cannibal's village.

Well, to get past the cannibal you must give him the watch for some odd reason. The watch can be found in Wrecker's Cove north of the rockpool. Then, this done, he will drop the spear which you can then collect.

Peter Walker in Moultan has been brought to a halt up against the vertical 'slab of rock', which, in actual fact, is a large rock door. You have to open it with the rod which is found along with the jewels. You should use the door to get back to the ship, and not to cross the bridge because it will collapse under the weight of you and the jewels. You can open the door by inserting the rod into the small hole to one side of the door.

Another problem with Fantasia Diamond. Apparently, Aran Wileman of Luton is simply 'stuck' and cannot get very far in the game. All I can say to help is that you must find the small key somewhere in the maze under the manhole, which you must then use to open the small door which is also somewhere down there. And as for hating the pixies, I agree with you, but the best thing to do to avoid them is to run in the opposite direction. However, the small key tends to be in the dungeon along with the friendly elf, so it looks like the cunning pixie will have to drag you away at least once for you to get at it. Remember to eat food or sandwiches as soon as you become weak, that is, as long as that stupid robot doesn't take them from you.

Let's turn to a review of 'Amstrad Pentacle ' from Interface. 'Pentacle' is in the form of a book from Interface, priced at only £2.99. The book contains the actual listing of Pentacle, a 'demo' adventure that you create using it and a graphical adventure that hasn't really got much to do with the main program. As the main program goes, it's reasonably good but the instructions supplied are brief and poorly presented. On the other hand, it is only £2.99. To create a room with various treasures therein, you enter numerical data which can be very inaccurate for your requirements. However, you can save your adventure onto tape, and if any software house is desperate enough to warrant your adventure good enough for publication, Interface promise you won't have to pay a penny to them.

Emerald Isle

Once 'Emerald Isle' has loaded, you will find yourself stuck halfway up a tree, strapped into your parachute. After releasing yourself from it and falling into the waiting arms of another tree you are set to explore Emerald Isle.

At this point I would like to say it is very good idea to send off for the clue sheet, which will go a long way to helping complete the adventure. The clue sheet will give answers to problems but it won't give you step by step guide to completing the adventure.

The graphics in this adventure (like all other Level 9 adventures) are colourful but not original. Some of the graphics are very repetitive. For example, at the beginning, you get the same picture of a forest over and over again and later on some of the screens are simply mirror images of each other, with the addition of the odd table here and there.

The graphics, however, do not detract from what is a very enjoyable and very well thought up adventure; with some amusing touches like after being run over by a train the 'creator' gives you three chances before giving up on you.

The vocabulary is up to Level 9 standard - you won't be finding yourself trying to think which word the computer knows and you don't!

The blurb on the typical Level 9 box talks about the family who run Level 9, instead of all the amazing reviews of the game they could dig-up that usually appear on the back. Pete, Nick and Michael Austin are all programmers....obviously first class ones, going by their efforts to date.

Now, I'd better give you a run-down on the basic storyline of Emerald Isle. You play the part of an aircraft pilot, employed to ferry urgent documents around the Carribbean. Fierce winds seize the plane over you've guessed it....the Bermuda Triangle. You, of course, grab a parachute and bail-out. You find yourself, as I mentioned before, halfway up a tree on Emerald Isle. Prepare for more cliches. You have also heard that nobody ever returns from Emerald Isle. Anyway, you've

discovered that only one person can live and that's you. If you've got the time and an anti-glare screen. Yes folks, it's an extremely long adventure from the look of things, as well as being difficult for any type of adventurer - White Wizard or not.

If, from reading all this, you discover you want a copy, and you can't buy it from your local software dealer - you'll have to deal with the likes of Mrs. Austen who has a cut of the profits by offering to deal with Level 9's mail order. You can write for further details to:-

Level 9 Computing
229 Hughenden Road,
High Wycombe
Bucks. HP13 5PG

Forest at World's End

Now a review of "Forest at World's End", from Interceptor. I think this is a very enjoyable adventure, even though it's been out for some time now.

This has many different creatures to kill with different weapons and over seventy locations to explore. The graphics are up to the usual Interceptor standard, but they tend to be repeated a lot when you are lost in a maze, or similar, and become boring because they take so long to draw. But I did enjoy this adventure more than any other from Interceptor probably because it was about my standard in complexity.

The vocabulary, however, let it down a lot, especially if you compare it with Level 9 adventures' vocabulary. Often, I would find myself trying to find a particular sentence, and, after discovering it, I found it had almost exactly the same wording as my sentences. Do not be discouraged by this, however, because "Forest at World's End" is worth every penny you pay.

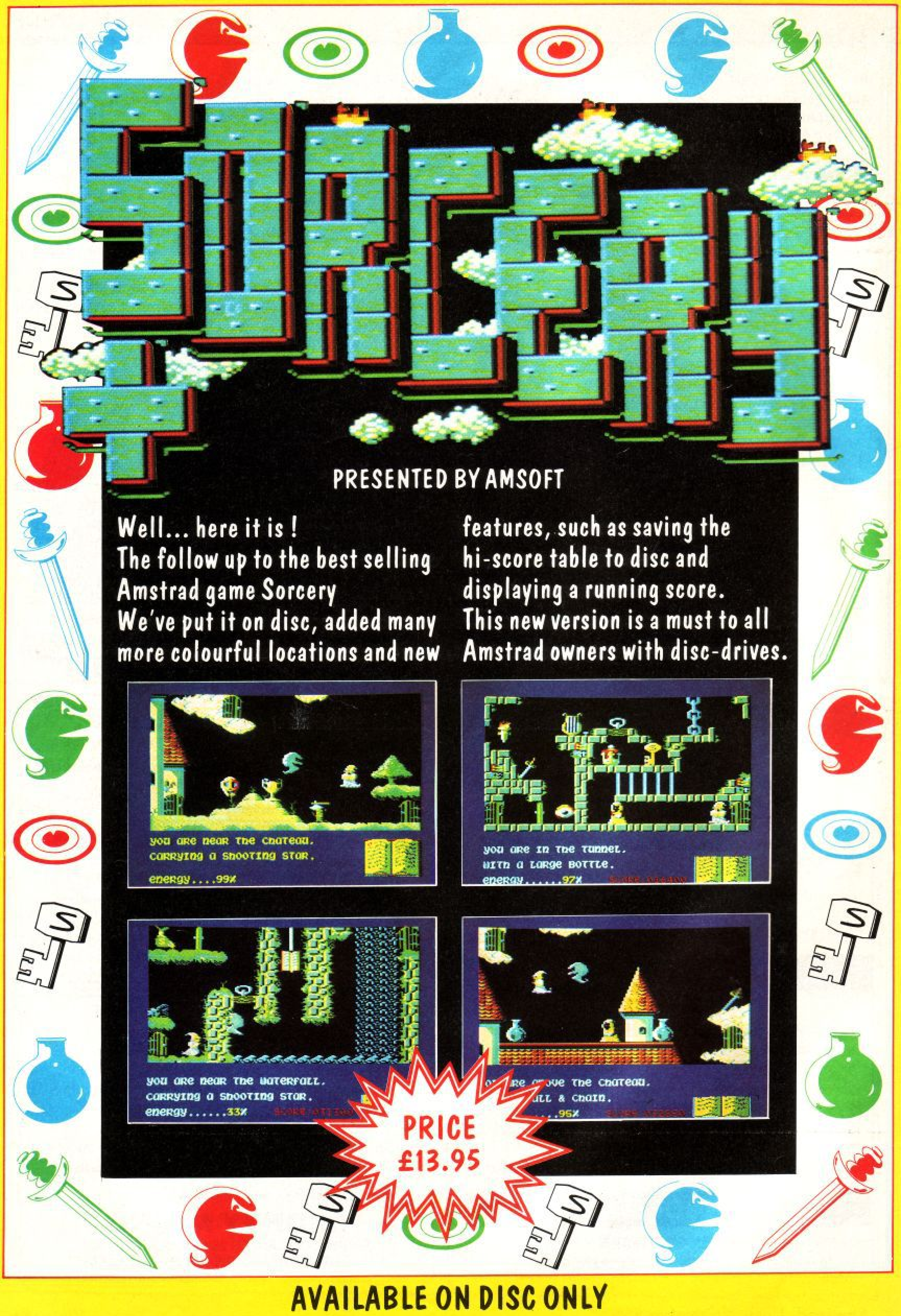
Now to the letters; C.Hooper from West Drayton in Middlesex wants to know how to get the scissors in Mikro-Gen's 'Pyjamarama'. Well, to explain how to get it really needs a lot of wording, because if I tell you that you need the crash helmet which you can collect by getting the ignition keys and then sliding down the bannisters (the helmet is the thing that looks like a skull at the bottom of one flight of stairs, on a chest).

James Marshallsea from Oldham has very kindly sent in a method of 'scrapping' the dreadful character set in Colossal Adventure from Level 9. It's a very short program, but you must follow the instructions carefully.

```
100 SYMBOL AFTER 32
110 MEMORY #2FFF
120 LOAD "ADVENTURE"
130 CALL #3000
```

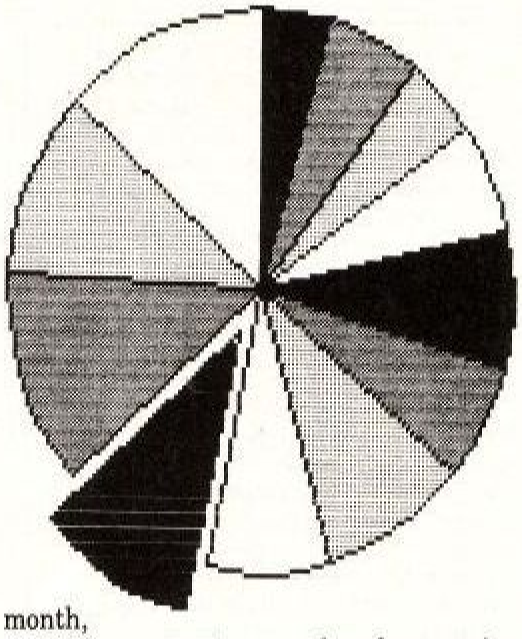
If you don't want the Level 9 character set then drop line 100, insert the tape and run the program. The actual data for the character set is loaded after block 14, so you'll have to press ESCAPE as soon as block 14 has finished loading. After the *Break* sign has appeared, then GOTO 130 and you can now play the game without inducing severe eye strain. Mr Marshallsea suggests that you load the numeric keypad with often used verbs, so that lengthy sentences do not take so long to enter.

ACU


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you are near the chateau.
carrying a shooting star.
energy....99%
you are in the tunnel.
with a large bottle.
you are near the waterfall.
carrying a shooting star.
energy......33%
PRICE £13.95
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AMGRAPH

By John Palmer



Amgraph is a fully menu driven business graphics program for the Amstrad CPC464/664. Up to four sets of data with up to twelve items in each set can be entered and then displayed in any combination by bar, line, stacked bar and 3D bar graphs. A pie chart is also included and can be used to represent a set of data or a cross section of the data thereby comparing a particular item in each set. In each of these, percentages are given and a slice of the pie can be highlighted by pulling it away from the main pie.

All input into the program is handled by routines which tightly contol the input so nonsense entries are not accepted and the screen is kept neatly formatted. So that the user does not lose track of what is being entered, the input is done on a green background and screen prompts are always given. Data, once entered, can be easily viewed and amended and there is also a save and load data option.

The general format option allows labels for the graphs to be entered and a year option is included which labels the data by months from the starting month number. That is, entering 5 would label May to April.

All scaling is done by the program but you can set the base line for the graphs to make the differences between the data more pronounced or to show variations from a particular number.

The program includes approx. 700 bytes of machine code which draw the various bars and provide a mode 1 Epson compatible shaded screen dump. After entering the program, readers are advised to save it before running as, although the machine code data includes checksums, a crash will inevitably result in the loss of the program. Readers using the CPC664 should change line 40 of the program as shown as this will result in a more colourful pie chart and better dotted line drawing.

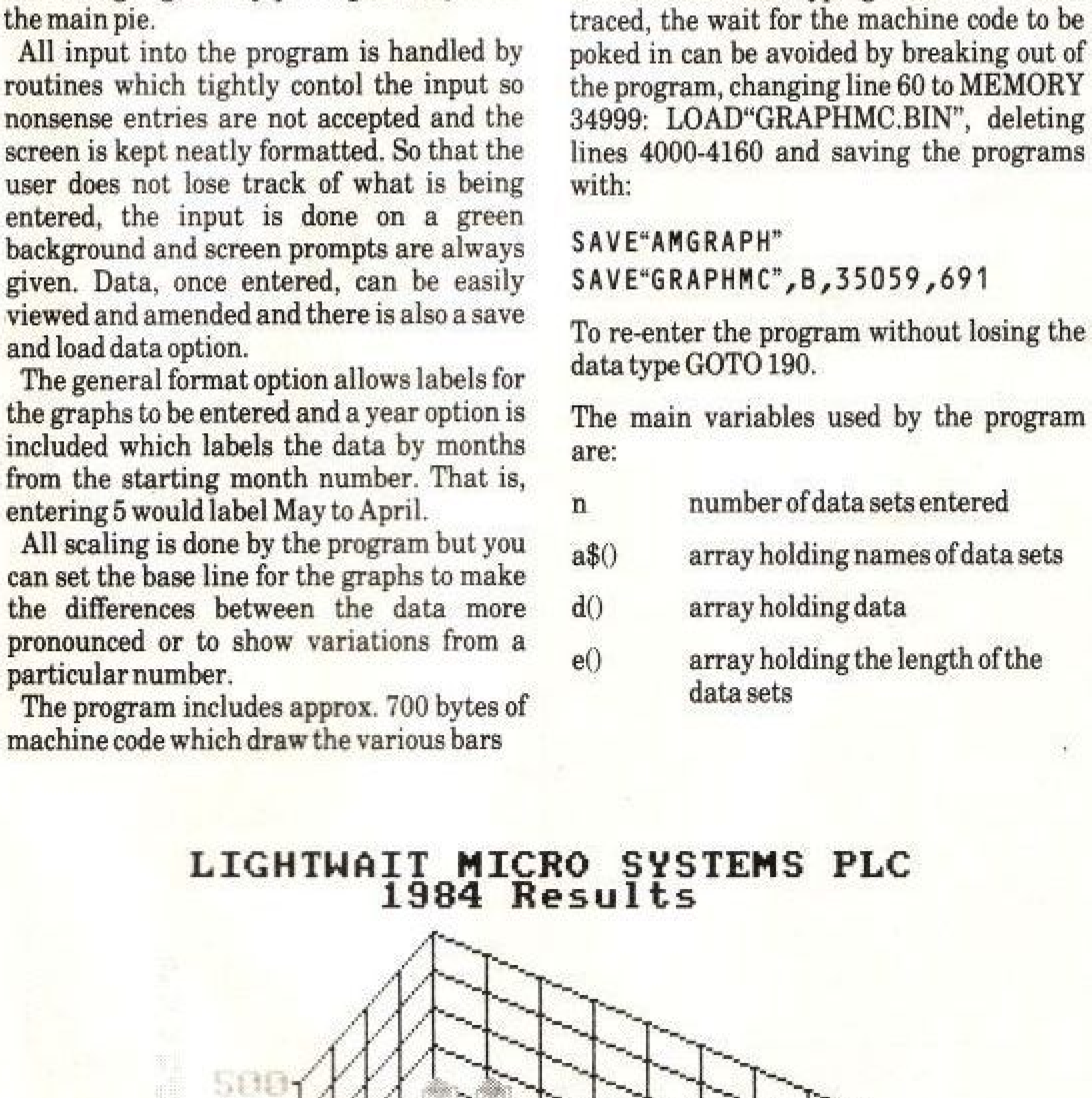
When the program is running correctly and the inevitable typing errors have been traced, the wait for the machine code to be poked in can be avoided by breaking out of the program, changing line 60 to MEMORY 34999: LOAD"GRAPHMC.BIN", deleting lines 4000-4160 and saving the programs with:

```
SAVE"AMGRAPH"
SAVE"GRAPHMC",B,35059,691
```

To re-enter the program without losing the data type GOTO 190.

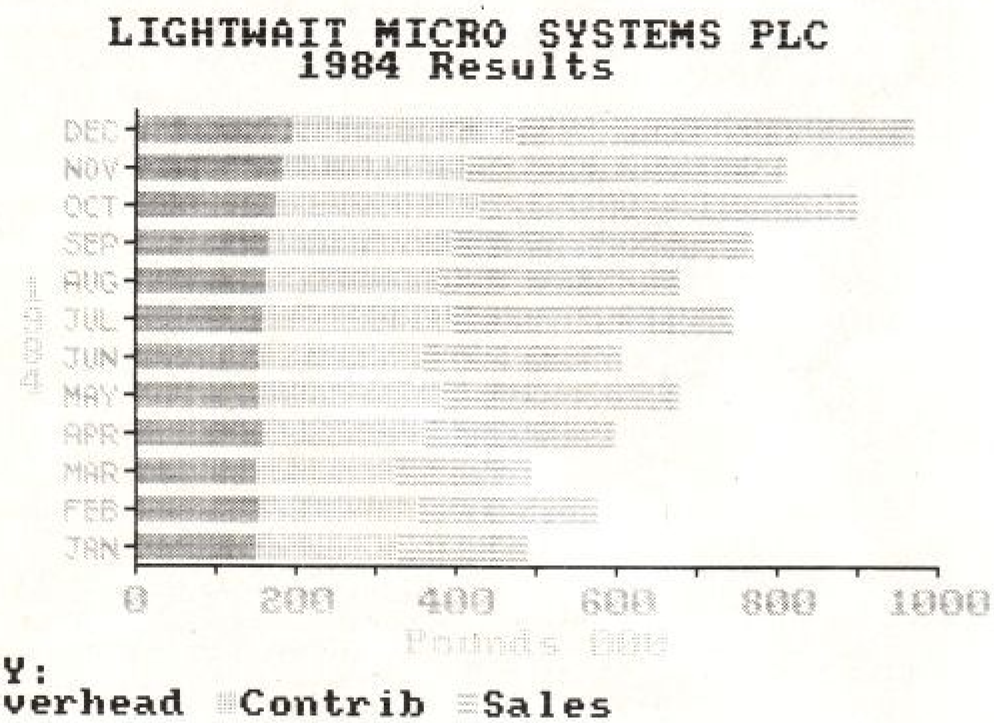
The main variables used by the program are:

n	number of data sets entered
a$()	array holding names of data sets
d()	array holding data
e()	array holding the length of the data sets
month, month$	starting month and year string
msc	base line for graphs
t$,s$,x$,y$	graph labels
sc,s,s5	scale factor, power of 10 within which data lies and whether scaled data is <2.5,5 or 10 used to limit size of numbers on graph axis menu option heading and number
k	used to pick up variables for input routine
d$,d1	string of input and length




```
10 REM************************************
20 REM*    AMGRAPH by John Palmer     *
30 REM************************************
40 cpc464=-1:REM Change to 0 if 664
50 SYMBOL AFTER 229:OPENOUT "dummy":MEMO
   RY HIMEM-1:CLOSEOUT
60 MEMORY 34999:GOSUB 4000:RESTORE
70 MODE 1:INK 0,0:INK 1,26:INK 2,18:INK
   3,6:BORDER 0:WINDOW#1,1,40,25,25:PAPE
   R#1,3:WINDOW#2,1,40,24,25:PAPER#2,3:W
   INDOW#3,1,40,24,25:DEG
80 DIM opt$(9),b$(5),a$(4),d(12,4),e(4):
   e(0)=12:FOR f=0 TO 9:READ opt$(f):NEX
   T:FOR f=0 TO 4:READ b$(f):NEXT:t$="Ti
   tle":x$="xaxis":y$="yaxis"
90 DATA AMGRAPH,Initial input of data,Ad
   d/Amend/Display data,General format,B
   ar graph,Line graph,Pie chart,Stacked
    bar graph,3d bar graph,Load/Save dat
   a
100 DATA Enter name of data (max 8 chars
    ),Enter data or press 'E' to exit,En
    ter required number(s),Enter number,
    Enter new details
110 FOR f=229 TO 255:IF f=233 THEN 130
120 READ x1,x2,x3,x4,x5,x6:SYMBOL f,0,x1
    ,x2,x3,x4,x5,x6,0
130 NEXT:FOR f=234 TO 255:year$=year$+CH
    R$(f):IF f=241 THEN year$=year$+CHR$
    (238)
140 IF f=244 THEN year$=year$+CHR$(243)
150 NEXT
160 DATA 126,0,126,0,126,0,0,0,146,0,0,0
    ,0,0,254,0,0,0,42,42,42,42,42,42,249
```

```
,18,18,19,146,98,145,89,93,215,83,81
,251,130,243,130,130,131,222,17,222,
17,17,222,137,218,250,171,138,138,15
8,81,81,222,82,81
170 DATA 115,138,138,251,138,138,158,81,
81,158,18,17,145,81,74,196,68,68,250
,18,18,18,146,97,81,89,93,87,83,145,
80,80,80,80,80,159,114,138,138,250,1
38,137,78,81,80,83,81,142,123,130,11
5,10,138,115,222,17,209,30,16,208
180 DATA 113,138,138,138,138,113,223,4,4
,4,4,196,137,202,234,186,154,137,145
,81,74,74,68,132,227,146,139,138,146
,227,206,17,208,16,17,206
190 REM**********************************
200 REM*          Menu                  *
210 REM**********************************
220 ms=0:GOSUB 2190
230 FOR f=1 TO 9:LOCATE 7,f*2+3:PRINT US
ING "#";f;:PRINT") ";opt$(f):NEXT
240 CLS#1:PRINT#1,TAB(11);"Select option
 number"
250 i$=INKEY$:IF i$="" THEN 250 ELSE ms=
ASC(i$)-48:IF ms<1 OR ms>9 THEN 250
260 IF n=0 AND ms<>3 AND ms>1 AND ms<9 T
HEN CLS#1:PRINT#1,TAB(12)"No data en
tered":FOR b=1 TO 500:NEXT:GOTO 240
270 ON ms GOTO 280,400,650,1000,1060,118
0,1470,1590,1710
```



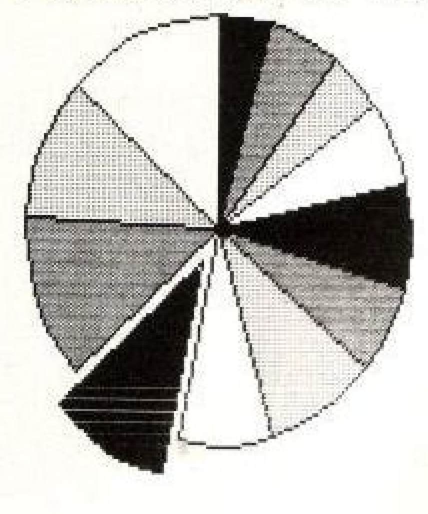

```
280 REM**********************************
290 REM*        Initial input           *
300 REM**********************************
310 CLS:IF n=0 THEN 350
320 LOCATE 16,12:PRINT"WARNING":LOCATE 4
,14:PRINT"Existing data will be over
written":LOCATE 6,16:PRINT"Do you wi
sh to continue (Y/N)"
330 i$=UPPER$(INKEY$):IF i$="N" THEN 190
 ELSE IF i$<>"Y" THEN 330
340 ERASE a$,d,e:DIM a$(4),d(12,4),e(4):
e(0)=12
350 g=0:GOSUB 2190:FOR f=1 TO 12:LOCATE
1,8+f:PRINT USING "##";f;:PRINT")":N
EXT
360 g=g+1:GOSUB 1850:IF g=4 THEN 390
370 CLS#1:PRINT#1,"Do you wish to enter
anymore data (Y/N)"
380 i$=UPPER$(INKEY$):IF i$="Y" THEN 360
 ELSE IF i$<>"N" THEN 380
390 n=g:GOTO 190
```

```
400 REM**********************************
410 REM*       Display data             *
420 REM**********************************
430 GOSUB 2190:GOSUB 2590:FOR f=1 TO 12:
LOCATE 1,8+f:PRINT USING "##";f;:IF
month=0 THEN PRINT ")" ELSE PEN 2:PR
INT MID$(month$,f*2-1,2):PEN 1
440 NEXT:FOR g=1 TO n:LOCATE g*9,6:PRINT
 USING"#";g;:PRINT")":LOCATE g*9+4-L
EN(a$(g)),7:PRINT a$(g)
450 FOR f=1 TO e(g):c$=STR$(d(f,g)):LOCA
TE g*9+4-LEN(c$),8+f:PRINT c$:NEXT:N
EXT
460 CLS#2:PRINT#2,"COMMANDS: M=Menu 1=Am
end dat: 2=Add data          3=Amend
 name 4=Print"
470 i$=UPPER$(INKEY$):IF i$="" THEN 470
ELSE IF i$="M" THEN 190 ELSE op=ASC(
i$)-48:IF op<1 OR op>4 THEN 470
480 IF op=4 THEN CLS#3:GOSUB 2870:GOTO 4
60
490 ON op GOSUB 500,570,610:GOTO 460
500 CLS#3:g=1:a=16:IF n>1 THEN GOSUB 630
:a=0
510 LOCATE 17-a,22:PRINT"Row number ":c$
=b$(3)
520 col=30-a:k=7:GOSUB 1910:f=VAL(d$):IF
 f<1 OR f>12 THEN 520
530 LOCATE 1,22:PRINT SPACE$(32)
```

```
540 k=0:GOSUB 1910:IF i=endat OR i=endat
+32 THEN d$=STR$(d(f,g)):dl=LEN(d$):
GOTO 2170
550 d(f,g)=VAL(d$):IF f>e(g) THEN e(g)=f
560 RETURN
570 IF n<4 THEN n=n+1:g=n:GOTO 600
580 CLS#3:GOSUB 630:CLS#2:PRINT#2,TAB(6)
"Data"+STR$(g)+" will be overwritten
.";TAB(5)"Do you wish to continue (Y
/N)"
590 i$=UPPER$(INKEY$):IF i$="N" THEN 460
 ELSE IF i$<>"Y" THEN 590
600 CLS#3:FOR f=1 TO 12:d(f,g)=0:LOCATE
g*9-3,f+8:PRINT SPACE$(7):NEXT:GOSUB
 1850:RETURN
610 CLS#3:g=1:IF n>1 THEN GOSUB 630
620 k=1:GOSUB 1910:a$(g)=d$:RETURN
630 LOCATE 1,22:PRINT"Column number ":k=
3:GOSUB 1910:g=VAL(d$):IF op<>1 THEN
 LOCATE 1,22:PRINT SPACE$(16)
640 RETURN
```

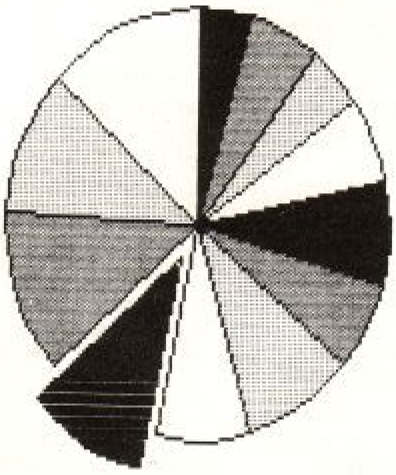
```
650 REM**********************************
660 REM*          Format                *
670 REM**********************************
680 GOSUB 2190:LOCATE 1,5:PRINT"1) Title
: ":PRINT TAB(4);t$
690 PRINT:PRINT:PRINT"2) Sub-title: ":PR
INT TAB(4);s$
700 PRINT:PRINT:PRINT"3) X axis label: "
 ;x$
710 PRINT:PRINT:PRINT"4) Y axis label: "
;y$
720 PRINT:PRINT:PRINT"5) Base figure for
 graphs:";msc
730 PRINT:PRINT:PRINT"6) Year option: ";
740 IF month=0 THEN PRINT"No"; ELSE PRIN
T"Yes"
750 LOCATE 22,22:PRINT"Start month:";mon
th
760 CLS#1:PRINT#1,"  Press number to cha
nge or M for menu"
770 i$=UPPER$(INKEY$):IF i$="" THEN 770
ELSE IF i$="M" THEN 190 ELSE op=ASC(
i$)-48:IF op<1 OR op>6 THEN 770
780 col=4:length=36:IF op=1 THEN lin=6:G
OSUB 890:t$=d$
790 IF op=2 THEN lin=10:GOSUB 890:s$=d$
800 col=18:length=12:IF op=3 THEN lin=13
:GOSUB 890:x$=d$
810 IF op=4 THEN lin=16:GOSUB 890:y$=d$
820 IF op=5 THEN k=6:GOSUB 1910:msc=VAL(
d$)
830 IF op<>6 THEN 760
840 CLS#1:PRINT#1,TAB(6)"Year option req
uired? (Y/N)"
850 i$=UPPER$(INKEY$):IF i$="N" THEN mon
th=0:LOCATE 17,22:PRINT"No ":LOCATE
35,22:PRINT"0 ":GOTO 760
860 IF i$<>"Y" THEN 850 ELSE LOCATE 17,2
2:PRINT"Yes"
870 c$="Enter starting month number for
year":col=37:k=7:GOSUB 1910:month=VA
L(d$):IF month<1 OR month>12 THEN 87
0
880 month$=RIGHT$(year$,(13-month)*2)+LE
FT$(year$,(month-1)*2):GOTO 760
890 PAPER 2:LOCATE col,lin:PEN 3:PRINT C
HR$(143);:PEN 0:PRINT SPACE$(length)
:d$="":IF ms=3 THEN c$=b$(4) ELSE c$
=b$(0)
900 CLS#1:PRINT#1,TAB(21-LEN(c$)/2)c$
910 i$=INKEY$:IF i$="" THEN 910 ELSE i=A
SC(i$)
920 IF i=127 THEN IF d$<>"" THEN LOCATE
col+LEN(d$),lin:PRINT" ":d$=LEFT$(d$
,LEN(d$)-1):GOTO 970 ELSE 910
930 IF i=13 THEN IF ms=9 AND d$="" THEN
980 ELSE 990
940 IF LEN(d$)=length THEN 980
950 IF i<32 OR i>126 THEN 980
960 d$=d$+i$
970 LOCATE col,lin:PRINT d$;:PEN 3:PRINT
 CHR$(143):PEN 0:GOTO 910
980 CLS#1:PRINT#1,TAB(10)"** Invalid ent
ry **":SOUND 1,75:FOR b=1 TO 500:NEX
T:GOTO 900
990 PAPER 0:PEN 1:LOCATE col,lin:PRINT d
$+SPACE$(1+length-LEN(d$)):RETURN
1000 REM*********************************
1010 REM*       Bar graph               *
1020 REM*********************************
1030 GOSUB 2190:GOSUB 2230
1040 IF dl=1 THEN wid=30:disp=0 ELSE IF
 dl=2 THEN wid=14:disp=15 ELSE IF dl
 =3 THEN wid=12:disp=8 ELSE wid=10:d
 isp=7
1050 POKE &88EE,wid:POKE &88EF,disp:CALL
 &88F3:GOTO 2730
```

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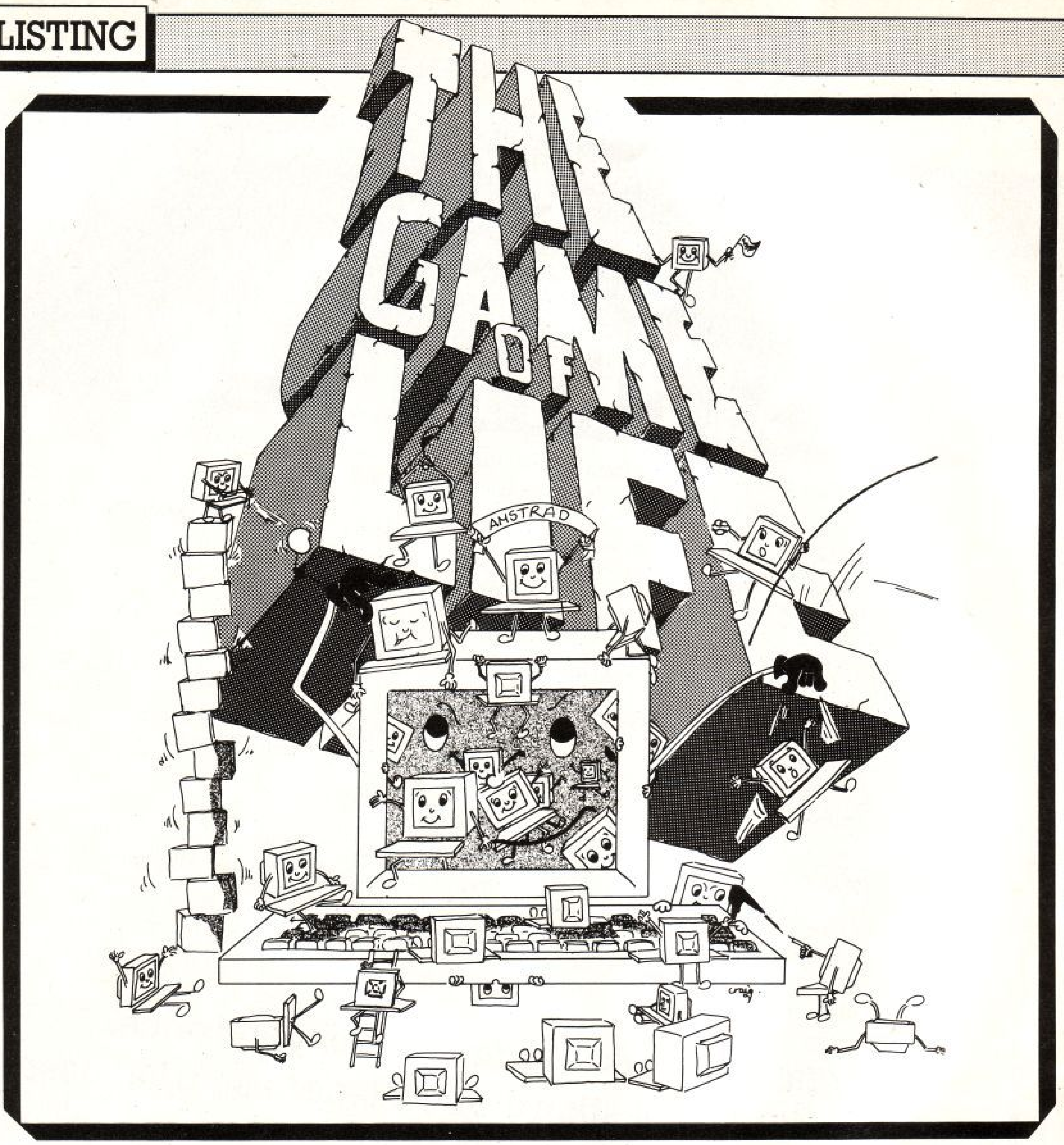


```
1060 REM*********************************
1070 REM*       Line graph              *
1080 REM*********************************
1090 GOSUB 2190:GOSUB 2230
1100 FOR a=1 TO dl:g=VAL(MID$(d$,a,1))
1110 IF NOT cpc464 AND g=4 THEN MASK 136,0:GRAPHICS PEN ,1
1120 x1=132:y1=112+(120 AND m=0.5)+(d(1,g)-msc)*sc:PLOT 1000,1000,g-(2 AND g=4):FOR f=2 TO e(g)
1130 fig%=(d(f,g)-d(f-1,g))*sc:IF NOT (cpc464 AND g=4) THEN MOVE x1,y1:DRAW x1+40,y1+fig%
1140 IF cpc464 AND g=4 THEN hyp=SQR(1600+fig%*fig%):x=40/hyp:y=fig%/hyp:FOR b=0 TO hyp STEP 8:PLOT x1+b*x,y1+b*y:NEXT
1150 x1=x1+40:y1=y1+fig%:NEXT
1160 IF NOT cpc464 AND g=4 THEN MASK 255,1
1170 NEXT:PLOT 1000,1000,1:GOTO 2730
1180 REM*********************************
1190 REM*       Pie chart               *
1200 REM*********************************
1210 GOSUB 2190:h=0:cross=0:IF n=1 THEN g=n:fin=e(g):IF e(g)<2 THEN 1320 ELSE 1290
1220 LOCATE 1,5:PRINT"Chart of":PRINT"Data or Cross-section? (D/C)"
1230 i$=UPPER$(INKEY$):IF i$<>"C" AND i$<>"D" THEN 1230
1240 LOCATE 30,6:PRINT i$:IF i$="D" THEN 1270
1250 cross=1:fin=n:LOCATE 1,12:PRINT"Item number":k=5:GOSUB 1910
1260 f=VAL(d$):IF f>MAX(e(1),e(2),e(3),e(4)) THEN 1250 ELSE 1290
1270 GOSUB 2230:LOCATE 1,16:PRINT"Chart of data":k=4:GOSUB 1910:g=VAL(d$):fin=e(g):IF e(g)<2 THEN 1320
1280 h=0:IF e(g)<2 THEN 1320
1290 CLS#3:LOCATE 1,18:PRINT"Do you want a segment":PRINT"of the pie highlighted? (Y/N)"
1300 i$=UPPER$(INKEY$):IF i$="N" THEN 1320 ELSE IF i$<>"Y" THEN 1300
1310 LOCATE 31,19:PRINT i$:LOCATE 1,22:PRINT"Segment number ":c$="Enter number to be highlighted":col=18:k=7:GOSUB 1910:h=VAL(d$)
1320 tot=0:FOR a=1 TO fin:IF cross=0 THEN f=a ELSE g=a
1330 tot=tot+ABS(d(f,g)):NEXT
1340 GOSUB 2580:LOCATE 30-cross*6,4:PRINT"Percentages":LOCATE 1,4:IF cross=0 THEN PRINT a$(g) ELSE  IF month=0 THEN PRINT"Item:";f ELSE PRINT"Month:";MID$(month$,f*2-1,2)
1350 numb$="#":var=0:FOR a=1 TO fin:ORIGIN 200,184:IF cross=0 THEN f=a ELSE g=a
1360 seg=360*ABS(d(f,g))/tot:IF a=h THEN ORIGIN 200+20*SIN(var+seg/2),184+20*COS(var+seg/2)
1370 b=var:WHILE b<var+seg:DRAW 120*SIN(b),120*COS(b):b=b+6:WEND
1380 var=var+seg:DRAW 120*SIN(var),120*COS(var):DRAW 0,0
1390 MOVE 110*SIN(var-seg/2),110*COS(var-seg/2):IF NOT cpc464 THEN FILL a MOD 4
1400 IF seg<12 AND a<>h THEN PEN 2:LOCATE 29-cross*6,5+a:PRINT"*":LOCATE 29,20:PRINT"* No label":LOCATE 31,21:PRINT"on chart":PEN 1:GOTO 1430
1410 MOVE 130*SIN(var-seg/2)+(16+(16 AND (a>9 OR (month<>0 AND cross=0))))*(XPOS-120)/240,130*COS(var-seg/2)+16*(YPOS+110)/240:TAG:IF a>9 THEN numb$="##"
1420 IF month<>0 AND cross=0 THEN PRINT MID$(month$,a*2-1,2); ELSE PRINT USING numb$;a;
1430 TAGOFF:ORIGIN 200,184:LOCATE 30-cross*6,5+a:IF cross=0 AND month<>0 THEN PRINT MID$(month$,a*2-1,2); ELSE PRINT USING numb$;a;
1440 PRINT")";:IF cross=1 THEN PRINT a$(g);
1450 PRINT TAB(34) USING "###.##";100*ABS(d(f,g))/tot;:PRINT"%"
1460 NEXT:ORIGIN 0,0:GOTO 2810
1470 REM*********************************
1480 REM*    Stacked bar chart          *
1490 REM*********************************
1500 GOSUB 2190:GOSUB 2230
1510 PLOT 112,352:DRAWR 0,-240:DRAWR 480,0
1520 IF grid=1 THEN FOR f=1 TO 12:MOVE 112,f*20+112:DRAWR 480,0:NEXT
1530 TAG:FOR f=1 TO 12:PLOT 106,f*20+102,1:DRAWR 4,0:PLOT 1000,1000,2:MOVE 70,f*20+108:IF month=0 THEN PRINT USING "##";f; ELSE PRINT MID$(month$,f*2-1,2);
1540 NEXT:FOR f=0 TO 10:PLOT 112+f*48,108,1:DRAWR 0,4+(240 AND grid=1):NEXT
1550 PLOT 1000,1000,2:FOR f=0 TO 10 STEP 2:MOVE 106+f*48,100:GOSUB 2910:NEXT
1560 PLOT 1000,1000,3:MOVE 354-16*LEN(y$)/2,78:PRINT y$;:IF s>2 THEN PRINT" (x";STR$(10↑(s-2));")";
1570 MOVE 60,246+16*LEN(x$)/2:FOR f=1 TO LEN(x$):MOVER -16,-16:PRINT MID$(x$,f,1);:NEXT
1580 TAGOFF:CALL &8965:GOTO 2730
1590 REM*********************************
1600 REM*       3d bar graph            *
1610 REM*********************************
1620 GOSUB 2190:GOSUB 2230
1630 FOR b=0 TO dl:MOVE 160+b*20,276+b*20:DRAWR 0,-100:DRAWR 384,-144:NEXT
1640 FOR b=176 TO 276 STEP 20:MOVE 156,b:DRAWR 4,0:DRAWR dl*20,dl*20:DRAWR 384,-144:NEXT
1650 FOR b=1 TO 12:MOVE 160+b*32,176-b*12:DRAWR dl*20,dl*20:DRAWR 0,100:NEXT
1660 TAG:PLOT 1000,1000,2:FOR f=0 TO 10 STEP 2:MOVE 156,182+f*10:GOSUB 2910:NEXT
1670 GOSUB 2960:PLOT 1000,1000,2:FOR b=0 TO 11:MOVE 152+b*32,166-b*12
1680 IF month=0 THEN MOVER -4,0:PRINT USING "##";b+1; ELSE PRINT MID$(month$,b*2+1,2);
1690 NEXT:PLOT 1000,1000,3:MOVE 278-20*LEN(x$)/2,90+8*LEN(x$)/2:FOR b=1 TO LEN(x$):MOVER 4,-8:PRINT MID$(x$,b,1);:NEXT:TAGOFF
1700 CALL &89DD:GOTO 2730
1710 REM*********************************
1720 REM*     Load/save data            *
1730 REM*********************************
1740 GOSUB 2190:LOCATE 1,5:PRINT"Load/Save or Exit? (L/S/E) ";
1750 s=0:i$=UPPER$(INKEY$):IF i$="E" THEN 190 ELSE IF i$="S" THEN s=1 ELSE IF i$<>"L" THEN 1750
1760 IF s=1 AND n=0 THEN CLS#1:PRINT#1,TAB(12)"No data entered":FOR b=1 TO 1000:NEXT:CLS#3:GOTO 1750
1770 PRINT i$:LOCATE 1,12:PRINT"Name of data:":length=8:lin=12:col=16:GOSUB 890
1780 PRINT:PRINT:IF s=1 THEN 1820
1790 OPENIN d$:INPUT#9,n,msc,t$,s$,x$,y$,month:IF month<>0 THEN INPUT#9,month$
1800 FOR g=1 TO n:INPUT#9,e(g),a$(g):FOR f=1 TO 12:INPUT#9,d(f,g):NEXT:NEXT
1810 CLOSEIN:GOTO 190
1820 OPENOUT d$:WRITE#9,n,msc,t$,s$,x$,y$,month:IF month<>0 THEN WRITE#9,month$
1830 FOR g=1 TO n:WRITE#9,e(g),a$(g):FOR f=1 TO 12:WRITE#9,d(f,g):NEXT:NEXT
1840 CLOSEOUT:GOTO 190
1850 REM*********************************
1860 REM*         Data input            *
1870 REM*********************************
1880 LOCATE g*9,6::PRINT USING"#";g;:PRINT")":k=1:GOSUB 1910:a$(g)=d$
1890 FOR f=1 TO 12:k=0:GOSUB 1910:IF i=endat OR i=endat+32 THEN 1900 ELSE d(f,g)=VAL(d$):NEXT
1900 e(g)=f-1:RETURN
1910 REM*********************************
1920 REM*    Main keyboard routine      *
1930 REM*********************************
1940 IF k=0 THEN lin=f+8:length=7:maxim=57:minim=45:c$=b$(1):endat=69:excep=47 ELSE endat=256:excep=0
1950 IF k=1 THEN lin=7:length=8:maxim=127:minim=31:c$=b$(0)
1960 IF k=2 THEN lin=18:col=24:length=n:c$=b$(2)
1970 IF k=3 THEN lin=22:length=1
1980 IF k=4 THEN lin=16:length=1
1990 IF k=5 THEN lin=12:length=2
2000 IF k=6 THEN lin=19:col=34:length=6
2010 IF k=7 THEN lin=22:length=2
2020 IF k<2 THEN col=g*9+4 ELSE IF k>2 AND k<6 THEN col=16
2030 IF k>4 THEN maxim=57:minim=48 ELSE IF k>1 THEN maxim=n+48:minim=49
2040 IF k>2 AND k<7 THEN c$=b$(3)
2050 PAPER 2:PEN 0:LOCATE col-length,lin:PRINT SPACE$(length):d$="":dl=0
2060 CLS#1:PRINT#1,TAB(21-LEN(c$)/2)c$
2070 i$=INKEY$:IF i$="" THEN 2070 ELSE i=ASC(i$)
2080 IF i=127 THEN IF dl<>0 THEN LOCATE col-dl,lin:PRINT" ":d$=LEFT$(d$,dl-1):GOTO 2160 ELSE 2070
2090 IF i=13 AND dl<>0 THEN 2170
2100 IF dl=length THEN 2180
2110 IF i=endat OR i=endat+32 AND d$="" THEN 2170
2120 IF i=46 AND k=0 THEN IF INSTR(d$,i$)<>0 THEN 2180
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2130 IF dl>1 AND i=45 AND k=0 THEN 2180
2140 IF i<minim OR i>maxim OR i=excep THEN 2180
2150 d$=d$+i$
2160 dl=LEN(d$):LOCATE col-dl,lin:PRINT d$:GOTO 2070
2170 PAPER 0:PEN 1:LOCATE col-length,lin:PRINT SPACE$(length-dl)+d$:RETURN
2180 CLS#1:PRINT#1,TAB(10)"** Invalid entry **":SOUND 1,75:FOR b=1 TO 500:NEXT:GOTO 2060
2190 REM**********************************
2200 REM*       Print heading            *
2210 REM**********************************
2220 CLS:PAPER 2:PEN 0:LOCATE (21-LEN(opt$(ms))/2),1:PRINT opt$(ms):PAPER 0:PEN 1:PRINT:RETURN
2230 REM**********************************
2240 REM*         Which data             *
2250 REM**********************************
2260 IF n=1 THEN d$="1":dl=1:IF ms=8 THEN 2390 ELSE 2330
2270 PRINT:PRINT:PRINT"Which data?":PRINT
2280 FOR f=1 TO n:PRINT USING"#";f;:PRINT") ";a$(f):NEXT:IF ms=6 THEN RETURN
2290 LOCATE 1,18:PRINT"Data to be graphed":k=2:GOSUB 1910:CLS:IF ms=8 THEN 2360
2300 REM**********************************
2310 REM*         Grid lines?            *
2320 REM**********************************
2330 LOCATE 2,12:PRINT"Do you want grid lines on graph (Y/N)"
2340 i$=UPPER$(INKEY$):IF i$="Y" THEN grid=1 ELSE IF i$="N" THEN grid=0 ELSE 2340
2350 CLS
2360 REM**********************************
2370 REM*           Scale                *
2380 REM**********************************
2390 LOCATE 14,10:PRINT"PLEASE WAIT":LOCATE 13,12:PRINT"SCALING DATA"
2400 IF ms=7 THEN FOR f=1 TO 12:d(f,0)=0:FOR a=1 TO dl:g=VAL(MID$(d$,a,1)):d(f,0)=d(f,0)+d(f,g):NEXT:NEXT:dl=1
2410 s=0:s5=4:m=1:FOR a=1 TO dl:IF ms=7 THEN g=0 ELSE g=VAL(MID$(d$,a,1))
2420 FOR f=1 TO e(g):k=0:b=ABS(d(f,g)-(msc AND ms<>7))
2430 WHILE b>10:b=b/10:k=k+1:WEND
2440 IF k>s THEN s=k:s5=4
2450 IF SGN(d(f,g)-msc)=-1 THEN m=0.5
2460 NEXT:FOR f=1 TO e(g):b=ABS(d(f,g)-(msc AND ms<>7))/10↑s
2470 IF b>5 THEN s5=1 ELSE IF b>2.5 AND s5<>1 THEN s5=2
2480 NEXT:NEXT:IF s>2 THEN xsc=2 ELSE xsc=s
2490 IF ms=7 THEN m=1:dl=LEN(d$)
2500 sc=24*m*s5/10↑s:IF ms=5 THEN 2580 ELSE IF ms=8 THEN sc=sc/2.4
2510 REM**********************************
2520 REM*         Poke data              *
2530 REM**********************************
2540 POKE 35001,dl:IF ms=4 THEN POKE 35000,114+(120 AND m=0.5) ELSE POKE 35000,170+(50 AND m=0.5)
2550 FOR a=dl TO 1 STEP-1:g=VAL(MID$(d$,a,1)):mem=(dl-a)*13+35002:POKE mem,g:mem=mem+1
2560 FOR f=1 TO e(g):IF ms=7 THEN POKE mem,ABS(d(f,g)*sc) ELSE POKE mem,INT((256 AND SGN((d(f,g)-msc))=-1)+(d(f,g)-msc)*sc)
2570 mem=mem+1:NEXT:NEXT
2580 CLS
2590 REM**********************************
2600 REM*        Print titles            *
2610 REM**********************************
2620 PRINT TAB(21-LEN(t$)/2);t$:PRINT TAB(21-LEN(s$)/2);s$:IF ms<4 OR ms>5 THEN RETURN
2630 REM**********************************
2640 REM*   Draw line and bar graph      *
2650 REM**********************************
2660 MOVE 112,352:DRAWR 0,-240:MOVE 112,112+(120 AND m=0.5):DRAWR 480,0
2670 FOR f=132 TO 592 STEP 40:MOVE f,108:DRAWR 0,2:IF grid=1 THEN MOVER 20 AND ms=4,2:DRAWR 0,240
2680 NEXT:FOR f=112 TO 352 STEP 24:MOVE 108,f:DRAWR 4+(480 AND grid=1),0:NEXT
2690 TAG:PLOT 1000,1000,2:FOR f=0 TO 10 STEP 2:MOVE 108,118+f*24:GOSUB 2910:NEXT
2700 GOSUB 2960
2710 PLOT 1000,1000,2:FOR b=0 TO 11:MOVE b*40+116-(8 AND month=0 AND b<9),100:IF month=0 THEN PRINT USING "##";b+1; ELSE PRINT MID$(month$,b*2+1,2);
2720 NEXT:PLOT 1000,1000,3:MOVE 354-16*LEN(x$)/2,79:PRINT x$;:TAGOFF:RETURN
2730 REM**********************************
2740 REM*            Key                 *
2750 REM**********************************
2760 LOCATE 1,22-(3 AND ms=8):PRINT"KEY:"
2770 FOR f=1 TO dl:g=VAL(MID$(d$,f,1)):PEN g-(2 AND g=4)
2780 IF ms<>5 THEN PRINT CHR$(233-(1 AND g=4)-(3 AND g=4 AND ms=7)); ELSE PRINT CHR$(231-(1 AND g=4));
2790 PEN 1:PRINT a$(g);" ";:IF ms=8 THEN PRINT
2800 NEXT
2810 REM**********************************
2820 REM*          Commands              *
2830 REM**********************************
2840 CLS#1:PRINT#1,"   COMMANDS: M=Menu P=Print R=Repeat"
2850 i$=UPPER$(INKEY$):IF i$="M" THEN 190 ELSE IF i$="R" THEN 270 ELSE IF i$<>"P" THEN 2850
2860 GOSUB 2870:GOTO 2840
2870 CLS#1:PRINT#1,TAB(14)"Please Wait"
2880 POKE &8B1C,144-(24 AND ms=2):CALL &8B09:IF PEEK(35000)=0 THEN RETURN
2890 CLS#1:PRINT#1,"Printer not on line - Retry/Cancel?(R/C)";
2900 i$=UPPER$(INKEY$):IF i$="C" THEN RETURN ELSE IF i$="R" THEN 2870 ELSE 2900
2910 REM**********************************
2920 REM*       Graph scale              *
2930 REM**********************************
2940 g=(f-(5 AND m=0.5))*10↑xsc/(s5*m):IF ms<>7 THEN g=g+INT(msc/10↑(s-xsc))
2950 g$=STR$(g):MOVER -16*LEN(g$)/(1+(1 AND ms=7)),0:PRINT g$;:RETURN
2960 x=112+(44 AND ms=8)-16*LEN(g$):y=246+(32 AND ms=8)
2970 IF s>2 THEN f$="x"+STR$(10↑(s-2)):MOVE x,y+16*LEN(f$)/2:FOR b=1 TO LEN(f$):MOVER -16,-16:PRINT MID$(f$,b,1);:NEXT
2980 PLOT 1000,1000,3:MOVE x-(16 AND s>2),y+16*LEN(y$)/2:FOR b=1 TO LEN(y$):MOVER -16,-16:PRINT MID$(y$,b,1);:NEXT:RETURN
4000 REM**********************************
4010 REM*     poke machine code          *
4020 REM**********************************
4030 CLS:PRINT"Poking machine code - Please wait"
4040 RESTORE 4080:x=35059:FOR a=0 TO 8:READ a$:tot=0:FOR b=1 TO LEN(a$)/2
4050 c=VAL("&"+MID$(a$,b*2-1,2)):tot=tot+c:POKE x,c:x=x+1:NEXT
4060 READ check:IF tot<>check THEN PRINT "Error in line ";4080+a*10:STOP
4070 NEXT:RETURN
4080 DATA DD21B988DD460026003AB8886FC5E52176003AEF885F1600783D28031918FAEBE1DD23DD7E0032F088CDDEBB060CC5E5D5DD2306007DFEEADD7E002009A7F23989ED444FED42D602380D32F1883AEE88,9500
4090 DATA 0F47CD8B8A10FBE10E2809EBE1C110CEC110AA063BAF21B888772310FC3CCDDEBBC93AB988110D0021BA88193D20FCE5E5DDE1FDE1217400060CC5FDE5DD23DDE53AB98847117200C5060DDD2BFD2B10,9708
4100 DATA FAFD7E0032F088CDDEBBE5DD7E00A728283D6F602922F188E1E50607CDE38AE5D5CDD38A210000ED5BF188CDEB8AD1E1232310E8CDC6BB1313E1C110BB0E1409DDE1FDE1C110A3C35689DD21B988DD46,11185
4110 DATA 00C5AFC61410FC4F21780009EB3AB88826006F09C1C5E5D5DD23DD7E0032F08860CC5DD2306000E20E5EB09EBE10E0CED42DD7E00A72812D5E5F2258AED444FED4232F188CD408AE1D1C110D5D1E10E,9772
4120 DATA 14EBED42EBED42C110BBC356893AF088CDDEBB060878FE052804FE03200222B2BCD8B8A10F0E5D501010042323CD8B8ACDA18A10F6D1E13AF088FE04C81B1BAF4FCDDEBBCD8B8ACDC6BBCDAD8ACDE38A11,10699
4130 DATA 0800626BCDEB8AC9CDD38ACDE38AE5D52AF188110000CDEB8AD1E11313C93AF088FE042005D602CDDEBBE5D5C5CDC6BB06073E05919028804D6022009232379A72803CDE38A1B1BCDE38A10E6C1D1E1C9,10372
4140 DATA 3AF088FE04C0CB402802D602CDDEBBC9C5D5E5CDEABB1806C5D5E5CDF9BBE1D1C1C91B401B33121B2A044001 0D0A000003030201020021F58A06057ECD2BBD380432B888C92310F3219001E5110000 0E,8339
4150 DATA 0206A0C5E521FA8A0605CD8C8BE1C1C5D5E5CD978B0E02EDB0E1D1D5E50602C52B2BD5E5CD978B06021A0707B6122313 10F7E1D1C110E821B988CD8A8BE1D1C1131310CB0D20BA21FF8ACD8A8BE1A70E,10300
4160 DATA 06ED427CA720A47DFE10209F21F58ACD8A8BAF32B888C906027ECD2BBD30FB7E2310F6C9CDF0BB21018B11B98887060 04F09C9,6093
```



This is not a great new idea. It has been around since Martin Gardner published the original concept in Scientific American magazine in 1970 and was renowned some years ago for using up all the expensive computer time on the old big mainframes. These days, it is fairly common to be able to blast into the humble Amstrad what used to be put on mainframes and then wonder what all the fuss was about.

It is basically an attempt to put some form of mathematical order to cell growth or cell growth to mathematical order. The screen is divided into units big enough for one cell each on a square grid so that each unit can have a maximum of eight neighbours.

If a cell is put in a unit and has no neighbours, the poor thing dies of loneliness. It also falls sick and dies if it has only one neighbour, but with two neighbours it will survive.

These cells have strange sex habits and if three of them surround an empty cell, a new one is created there. The idea of three parents per offspring is not an unusual concept in science fiction as anyone who has read "The Gods Themselves" by Isaac Asimov or the "Gor" series by John Norman will know.

If a live cell has three neighbours, then it either snuffs it and is regenerated or remains unchanged. It matters not a whit which because the net effect is the same. With more than three neighbours though, it dies from overcrowding or acute embarassment over it's sex life.

With these basic rules, patterns can be built up which breed, undergo population explosions and either die or reach a stable state. The classic formation in life is a 't' shape which reaches a stable state in ten generations. Use the cursor keys to move the cursor and press copy to place or remove a cell. When you are done, hit the space bar and your pattern will leap into life.

Repeating patterns are known as blinkers. Three cells in a line is the simplest blinker and the most complex one I have discovered so far starts like this:

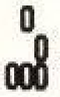
```
00
 00
 00
 00
00
```

This forms a complex blinker and takes three generations to blink once it has developed.

Ten cells in a row also make a blinker but this one lasts fifteen generations before it repeats itself.

Start this one in the middle of the screen or you will discover that in this program the patterns wrap round at the sides and anything off the top or bottom is regarded as an empty cell.

A special form of blinker is known as a glider which moves away as it blinks.



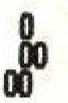
A Glider

There are other famous patterns which cannot be completed on a screen the size of the Amstrad's but which have been explored on other systems. One which does get off to a good start is the glider gun which shoots off gliders every so often but you only get one, or two if you're lucky, on the Amstrad's screen.



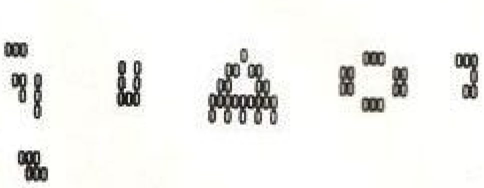
Glider Gun

The most amazing formation is the R-pentomino which reaches a stable state only after producing dozens of colonies and shooting off several gliders. There are even some patterns that just go on forever.



R-Pentomino

Type this program in and try it out, experimentation is the name of the game. Line up gliders so that they crash into blinkers, or each other. See what your initials do and crash gliders into them. This kind of thing has a simple addictiveness to it. Here are some of my favourite patterns, but be warned, you can spend hours at it.



To use it, guide the cursor around the screen with the cursor cluster or your joystick and use the fire button or copy key to place or remove a cell. When you have finished, hit the space bar and watch the pattern. The menu options are all displayed on the bottom of the screen, but remember that one option will not work from inside another, so do not try to quit while you are still in the editor.

If you feel like slowing it down a bit then hit the 'S' key. The border colour will change and the pattern will stop changing until you hit a key. Hitting the space bar will step through one generation at a time and any other key goes back to normal.

If you want to stick your oar in and modify a pattern, then thump the 'E' key and the cursor will appear back in the top corner of the screen again. Do your worst, and then hit the space bar to boldly seek out new civilizations where no user has gone before.

When you think you've had enough of one pattern, hit the 'C' key to clear the old pattern and start again.

If you find any interesting patterns, drop us a line. If it proves a popular program it might make a technicolour comeback in a future issue.

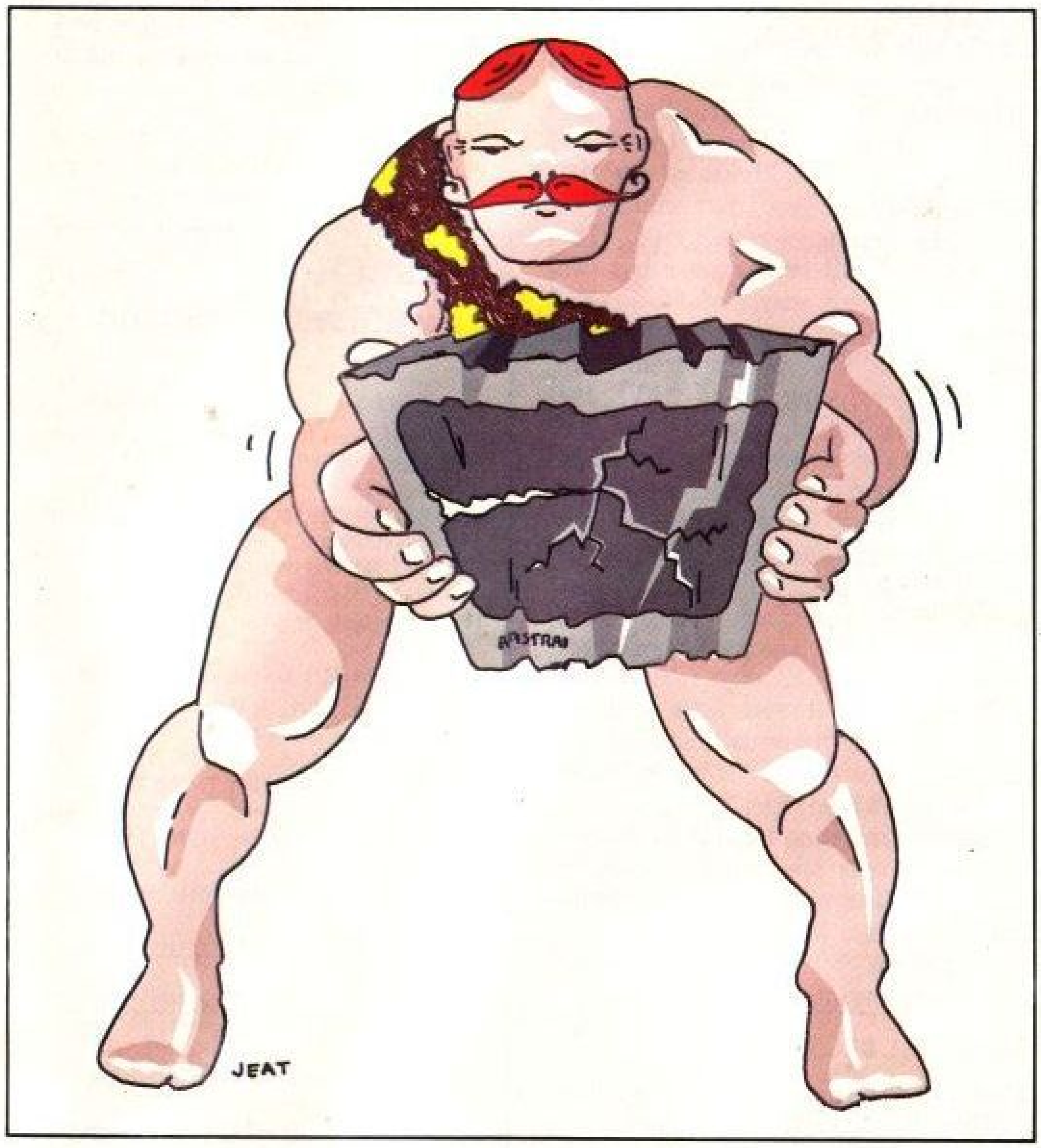
This is the bit where you get to challenge the idiot proof loader program we have designed. Type it in, SAVE IT. Then run it, correct the errors and save the corrections. Repeat as often as necessary.

HINT: IF YOUR PROGRAM DOES NOT WORK, RENUMBER IT AND CHECK THE LINE NUMBERS. IF THEY DON'T MATCH YOU HAVE PUT IN OR MISSED OUT A FEW LINES

```
10 MODE 2:s=&6000:l=210:v$="01234567
89abcdef":MEMORY &5FFF
20 t=0:l=l+10
30 PRINT"Coding line"l;CHR$(13);
40 FOR i=1 TO 8
50 READ a$:IF a$="*" THEN 170
60 GOSUB 140
70 u=VAL("&"+a$)
80 POKE s,u:t=t+u:s=s+1
90 NEXT
100 READ a$
110 GOSUB 130:IF VAL("&"+a$)=t THEN
20
120 PRINT:PRINT"Error in Line"l:END
130 IF INSTR(v$,LOWER$(MID$(a$,2,1))
)=0 THEN 120
140 IF INSTR(v$,LOWER$(LEFT$(a$,1)))
=0 THEN 120
150 IF INSTR(v$,LOWER$(RIGHT$(a$,1))
)=0 THEN 120
160 RETURN
170 PRINT:PRINT"Coding complete."
180 PRINT:PRINT"Press [R] to run or
[S] to save"
190 a$=UPPER$(INKEY$)
200 IF a$="R" THEN CALL &6000:END
210 IF a$="S" THEN SAVE"life" ELSE 1
90
220 DATA 3E,00,CD,0E,BC,21,9E,62,2F6
230 DATA 06,27,CD,21,62,01,D0,07,255
240 DATA C5,06,00,10,FE,C1,0B,78,31D
250 DATA B1,20,F5,21,16,63,01,B0,311
260 DATA 0E,11,17,63,36,00,ED,B0,26C
270 DATA AF,32,16,72,06,05,21,9D,232
280 DATA 62,36,30,2B,10,FB,3E,02,23E
290 DATA CD,0E,BC,2E,18,26,01,CD,2D1
300 DATA 75,BB,21,4F,62,06,4F,CD,324
310 DATA 21,62,21,02,01,CD,75,BB,2A4
320 DATA 2A,17,72,11,16,63,B7,ED,2E1
330 DATA 52,7C,B5,F5,CC,37,62,CD,4AA
340 DATA 81,BB,21,66,63,CD,1B,BB,3C9
350 DATA 30,FB,22,1B,72,FE,F0,28,3F0
360 DATA 2A,FE,F1,28,38,FE,F2,28,491
370 DATA 40,FE,F3,28,45,FE,E0,28,4A4
380 DATA 4A,FE,0B,28,16,FE,0A,28,2C1
390 DATA 24,FE,08,28,2C,FE,09,28,2AD
400 DATA 31,FE,58,28,36,FE,20,28,32B
410 DATA 5E,18,CA,11,50,00,B7,ED,345
420 DATA 52,CD,DB,60,E5,3E,0B,CD,455
430 DATA 5A,BB,E1,18,B8,11,50,00,327
440 DATA 19,CD,DB,60,E5,3E,0A,18,366
450 DATA EE,2B,CD,DB,60,E5,3E,08,44C
460 DATA 18,E5,23,CD,DB,60,E5,3E,44B
470 DATA 09,18,DC,7E,EE,01,77,3D,31E
480 DATA C4,FE,61,E5,CD,5D,BB,3E,52B
490 DATA 08,18,CC,E5,11,16,63,B7,312
500 DATA ED,52,30,08,E1,E1,2A,1B,37E
510 DATA 72,C3,65,60,19,11,46,6A,2D4
520 DATA B7,ED,52,30,EF,E1,C9,F1,5B0
530 DATA CC,43,62,CD,84,BB,CD,96,4E0
540 DATA 61,01,30,07,E5,DD,E1,CD,409
550 DATA 7C,61,FE,01,28,08,FE,02,30C
560 DATA 28,61,FE,03,28,61,AF,12,2D4
570 DATA 23,13,0B,78,B1,20,E5,CD,33C
580 DATA B8,61,3A,16,72,2F,32,16,252
590 DATA 72,3A,C5,62,B7,28,13,CD,392
600 DATA 1B,BB,30,FB,FE,20,28,C6,40D
610 DATA AF,32,C5,62,01,01,01,CD,2D8
620 DATA 38,BC,CD,1B,BB,30,B7,FE,47C
630 DATA 61,38,02,D6,20,FE,45,CA,39E
640 DATA 4A,60,FE,43,CA,1B,60,FE,42E
650 DATA 53,28,0A,FE,51,C2,FE,60,3F4
660 DATA 3E,02,C3,0E,BC,3E,01,32,23E
670 DATA C5,62,01,00,00,CD,38,BC,2E9
680 DATA C3,FE,60,7E,12,18,A1,3E,3A8
690 DATA 01,12,18,9C,AF,DD,86,AF,388
700 DATA DD,86,B0,DD,86,B1,DD,86,58A
710 DATA FF,DD,86,01,DD,86,4F,DD,4F2
720 DATA 86,50,DD,86,51,C9,3A,16,3A3
730 DATA 72,B7,28,0E,11,16,63,ED,2D6
740 DATA 53,19,72,21,96,6A,22,17,238
750 DATA 72,C9,21,16,63,22,17,72,280
760 DATA 11,96,6A,ED,53,19,72,C9,3A5
770 DATA 21,01,01,22,1B,72,CD,75,214
780 DATA BB,ED,5B,17,72,06,17,2A,2D3
790 DATA 19,72,C5,06,50,C5,7E,EB,3D4
800 DATA BE,EB,23,13,28,0B,E5,D5,3CC
810 DATA 3D,C4,FE,61,CD,01,62,D1,461
820 DATA E1,3A,1C,72,3C,32,1C,72,2A5
830 DATA C1,10,E2,3E,01,32,1C,72,2B2
840 DATA 3A,1B,72,3C,32,1B,72,C1,283
850 DATA 10,D0,CD,0C,62,C9,3E,20,342
860 DATA C9,F5,2A,1B,72,CD,75,BB,472
870 DATA F1,C3,5D,BB,21,9D,62,CD,4B9
880 DATA 2D,62,2B,28,FA,2E,18,26,248
890 DATA 4B,CD,75,BB,21,99,62,06,36A
900 DATA 05,C5,E5,7E,CD,5A,BB,E1,4F0
910 DATA 23,C1,10,F5,C9,7E,3C,FE,46A
920 DATA 3A,20,02,3E,30,77,C9,21,22B
930 DATA 96,6A,11,16,63,01,30,07,1C2
940 DATA ED,B0,C9,21,16,63,11,96,3A7
950 DATA 6A,01,30,07,ED,B0,C9,51,359
960 DATA 20,3D,20,51,75,69,74,20,240
970 DATA 20,45,20,3D,20,45,64,69,1F4
980 DATA 74,20,20,43,20,3D,20,43,1B7
990 DATA 6C,65,61,72,20,70,61,74,309
1000 DATA 74,65,72,6E,20,20,53,20,26C
1010 DATA 3D,20,53,69,6E,67,6C,65,2BF
1020 DATA 20,53,74,65,70,20,20,20,21C
1030 DATA 20,20,20,20,20,47,65,6E,1BA
1040 DATA 65,72,61,74,69,6F,6E,20,312
1050 DATA 20,30,30,30,30,30,1F,03,132
1060 DATA 09,54,68,65,20,47,61,6D,25F
1070 DATA 65,20,6F,66,20,4C,69,66,295
1080 DATA 65,0A,0D,0A,0A,20,20,20,0F0
1090 DATA 20,42,79,20,4B,49,57,49,22F
1100 DATA 53,4F,46,54,2E,00,00,00,16A
1110 DATA *
```

ACU

David Ellis gets more from his CPC by compressing the data.



Squash

The problem of saving a screen dump on the CPC 464 is that it requires 16K of memory to save any type of display - either text, or mixed text and graphics. With a cassette the problem is one of the amount of time that it takes to load the screen dump back to memory - even though the cassette speed is quite reasonable when compared with other micros. Speed is no problem if you have a disc set-up, but at 16K a time, your disc will not take that long to fill up.

SQUASH is a machine code program designed to reduce the amount of memory needed to hold all the information required to reproduce the original screen picture. This is accomplished in three ways:-

1. The current MODE, SCREEN OFFSET, BORDER and INK COLOURS are copied to tape. If possible it is preferable to make sure that the SCREEN OFFSET is set to zero (by issuing a MODE command), or you may find a small part of the display (one line) different from when it was saved.

2. The 200 Horizontal lines are compared in order to see if any are the same

3. The 80 memory locations for each of the 200 lines are checked to see if there are any sequences of repeating numbers.

The three programs as shown in listings 1, 2 and 3 work as follows:-

Listing 1

This is the program that does all the hard work of checking and compressing. MEMORY is set to &5000 in line 10. This is to allow enough room for the compressed data which is stored from &9000 downwards. The data may not reach anywhere near &5000 but it is necessary to set this figure just in case it should. The actual machine code program is located at &9030 onwards. The locations between &9000 and &9030 are used to hold the information for the Mode, Border and Ink colours. The machine code program is split up into 9 different sections which will make it easier for you to key in. Each section also has a checksum number to make sure that you get the data right. If you enter any data wrong then the Basic program will tell you which section the error is in.

Section 1 clears all the various buffers that are used, to zero. Section 2 checks all 16000 screen locations to find out what numbers are being used on the screen. It does this by zeroing a block of 256 memory locations and then using the number from the screen as the LSB address of the block. The screen number is then copied to this address in the block. At the end of the check, any numbers in the block that still remain at zero are therefore not being used on the screen.

Section 3 then checks through this block to count how many 'free' numbers are available. The reason for all this is that the SQUASH program requires two numbers which it uses as 'markers' to signal lines that are the same, and sequences of characters that are the same. Obviously if all 256 possible 8 bit numbers are being used on the screen, then there are no numbers that can be used as markers.

About the only time that this would happen is if you were to deliberately poke all 256 numbers to the screen memory. Even with the most complex of pictures there are usually several dozen free numbers available. If there are not two markers available, then the program will now return back to Basic, otherwise it will continue to section 4.

Section 4 first sounds a BEEP to let you know that two markers are available. These are then placed at &9001/3.

Section 5 then fetches the current values for the SCREEN OFFSET, MODE, BORDER and INK COLOURS, and these are stored from &9004 to &902C.

Sections 6 and 7 create a couple of 'blocks' which contain data for helping with the checking of the lines.

Section 8 then compares the 200 screen lines to see if any are the same. Lines that are the same will only use up two bytes - the marker number, followed by the number of the similar line.

Section 9 will then check each individual line of 80 bytes (unless it starts with the 'same as' marker) and see if there is any repetition of numbers. If there are more than three consecutive numbers the same then these are represented as :-

Marker (2) number
The amount of numbers that are the same.
The number itself.

As this uses up three bytes then it is only worth doing if there are more than three numbers the same. For example, a complete line of 80 numbers all the same - let's say 99 - would be compressed to:-

```
128099
```

Assuming that 12 represents the second marker number.

This section also stores these numbers and markers from &9000, working its way towards low memory. The address of the final location used is stored at &9008/9 to enable the length of the squashed file to be calculated. As you may well gather, rather a lot of work has to be done by the program -one reason why it is in machine code.

Listing 2

Compared with the program to compress the screen data, the program to 'un-compress' this data is relatively simple. The MODE, OFFSET and INK COLOURS are set up first. The numbers stored from &9000 downwards are then checked. If a marker number is found then the relevant action is taken with the following numbers, otherwise the number is copied out to the screen. The machine code program in listing 2 is stored at &9200 onwards.

Listing 3

This program is designed to be used as a subroutine for calculating the length of the squashed file, and for saving this file to tape as will be explained shortly.

Using the programs

Type out listing 1 and when the program runs without any errors in the data then SAVE it to tape. RUN the Basic program which will POKE the machine code program to memory. The Basic program can then be NEWed as it is no longer needed. It is, however, wise to keep a copy on tape as a back-up.

Type out listing 2 - SAVE it - RUN it - NEW it.

Now you are ready to see if the program works.

Set the OFFSET to zero by typing MODE 0, MODE 1, or MODE 2.

Now type or draw something on the screen - be careful not to scroll the screen as this will change the OFFSET from its present value of 0. To save the screen picture as a compressed file then type:-

```
CALL&9030
```

If all is well you will hear the BEEP and Ready will reappear within 1 to 10 seconds, depending upon the complexity of the screen.

To check if the decoding program (listing 2) works correctly; first change the MODE and the BORDER and INK colours if you wish - or just clear the screen - and then type:-

```
CALL&9200
```

If all is well, your original picture should be displayed within one second. If the program does not work correctly then check all the data in the lists to see that you have entered it properly. Checksums are not foolproof -after all, you may enter two values the wrong way around. The checksum will still be the same but two values the wrong way around in the machine code program spell disaster. When the two programs are working, enter listing 3 and SAVE the compressed file to tape (or disc). If you are just creating and saving pictures onto tape then the program in listing 2 does not need to be in memory. Likewise, if you are reloading the files back into memory to be re-displayed, the program in listing 1 does not need to be in memory. They are both quite happy to work together or separately if required.

Let's assume that you have a Basic program for creating some fancy pictures that you want to save in compressed form. This is what you need to do:-

Firstly, load in listing 1 and RUN it to put the machine code program into memory. Load in your Basic program for creating the pictures and then MERGE the subroutine in listing 3 into your Basic program. Insert the following line into this subroutine:-

```
10005 CALL&9030
```

When you have created your picture then GOSUB 10000, enter the file name that you wish to give to the picture, and the file will be saved to tape as a Binary file. Repeat this process if you require to save more pictures.

To re-display the pictures then load the program in listing 2 and RUN it. If you had saved 5 pictures on tape then these could be displayed one after the other by using a program such as:-

```
10 FOR DISPLAY = 1 TO 5
20 LOAD "!"
30 CALL &9200
40 NEXT DISPLAY
```

Each picture will then be loaded in and displayed.

Just how much memory is saved though?

On average, the saving will be about 50%, which in computer terms is a considerable saving. Very simple pictures may use up only 1K of memory whilst complex pictures may use 12K or more. Many of my pictures seem to use up about 8K so you'll be able to get twice as many pictures onto tape or disk, and take half the time required for loading them in.

In some instances your program to create the pictures will be much smaller than the compressed file. However, if the drawing routine is a complex 3D shape, using many mathematical formulae, the time it takes to draw the picture can be considerable -sometimes hours - even though the CPC464 is no sloth. This is the sort of situation where this compression technique is at its most useful.

Listing 1 - The squash program

```
10 MEMORY &5000:location=&9030:E$="ERROR
   IN "
20 GOSUB  500:IF checksum <> 1528 THEN P
  RINT E$;"1"
30 GOSUB  500:IF checksum <> 1320 THEN P
  RINT E$;"2"
40 GOSUB  500:IF checksum <> 2488 THEN P
  RINT E$;"3"
50 GOSUB  500:IF checksum <> 1831 THEN P
  RINT E$;"4"
60 GOSUB  500:IF checksum <> 5360 THEN P
  RINT E$;"5"
70 GOSUB  500:IF checksum <> 1611 THEN P
  RINT E$;"6"
80 GOSUB  500:IF checksum <>  806 THEN P
  RINT E$;"7"
100 GOSUB 500:IF checksum <>10394 THEN P
   RINT E$;"8"
120 GOSUB 500:IF checksum <>13339 THEN P
   RINT E$;"9"
199 END:'*******************************
   ***********
500 checksum=0:code$="":READ code$
510 WHILE code$<>"-1":number=VAL("&"+cod
   e$)
520 POKE location,number:location=locati
   on+1
530 checksum=checksum+number:READ code$:
   WEND:RETURN
999 END:'*******************************
   ***********
1000 '1*****************CLEAR all BUFFERS
     to ZERO****************************
    *
1010 DATA 21,0,90,3e,0,77,23,77,23,77,1,
    0,4,21,0,93,36,0,23,b,78,b1,20,f8,-
    1
1020 '----------------------------------
2000 '2*****************CHECK for FREE NU
    MBERS*******************************
2010 DATA 1,0,40,21,0,c0,16,93,7e,5f,12,
    23,b,78,b1,20,f7,-1
2020 '----------------------------------
3000 '3*****************RETURN if to few
    POINTERS****************************
3010 DATA 16,0,21,ff,93,6,ff,7e,fe,0,20,
    1,14,2b,10,f7,7a,fe,0,c8,fe,1,c8,-1
3020 '----------------------------------
4000 '4*****************PUT MARKERS to BU
    FFER..9001/3************************
4010 DATA 3e,7,cd,5a,bb,21,1,93,6,2,11,1
    ,90,7e,fe,0,20,6,7d,12,13,5,28,3,23
4020 DATA 18,f2,-1
4030 '----------------------------------
5000 '5*****************COPY MODE,OFFSET
    & COLOURS***************************
5010 DATA cd,b,bc,22,5,90,21,0,0,cd,5,bc
    ,cd,11,bc,32,4,90,21,a,90,e5,cd
5020 DATA 3b,bc,e1,70,23,71,23,3e,10,f5,
    e5,cd,35,bc,e1,f1,70,23,71,23,3d
5030 DATA fe,0,20,f0,-1
5040 '----------------------------------
6000 '6*****************CREATE 400 BLOCK
    of SCREEN ADDRESSES*****************
```

```
6010 DATA 6,c8,11,0,94,21,0,c0,7d,12,13,
     7c,12,13,cd,26,bc,10,f5,-1
6020 '-----------------------------------
7000 '7****************CREATE 200 BLOCK*
     ************************************
7010 DATA 21,0,93,6,c8,75,23,10,fc,-1
7020 '-----------------------------------
8000 '8*************** COMPARE THE LINES
8010 DATA 21,0,93,e5,21,1,93,dd,21,0,94,
     fd,21,2,94,dd,46,1,dd,4e,0,fd,56,1
8020 DATA fd,5e,0,7d,be,20,11,e5,c5,e1,6
     ,50,1a,be,20,9,13,23,10,f8,e1,c1,71
8030 DATA c5,e5,e1,7d,fe,c7,20,16,e1,7d,
     fe,c6,28,17,dd,23,dd,23,23,7d,be,20
8040 DATA f2,e5,dd,e5,fd,e1,18,c2,fd,23,
     fd,23,23,18,bb,-1
8050 '-----------------------------------
9000 '9*************** SQUASH THE LINES
9010 DATA 11,0,90,3e,1,12,1b,1,0,c8,dd,2
     1,0,94,fd,21,0,93,d5,dd,66,1,dd,6e,
     0
9020 DATA fd,7e,0,b9,20,62,c5,1,50,0,11,
     0,96,ed,b0,3a,1,90,32,50,96,c1,d1,c
     5
9030 DATA 21,0,96,3e,0,32,7,90,6,1,7e,23
     ,4f,3a,1,90,be,28,32,79,be,20,3,4

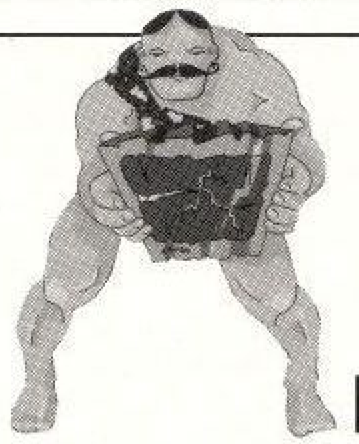
9040 DATA 18,f1,4f,78,fe,3,28,15,fe,2,28
     ,11,fe,1,28,d,3a,2,90,12,1b,78,12,1
     b
9050 DATA 79,12,1b,18,5,79,12,1b,10,fc,3
     a,7,90,fe,63,28,c,18,c5,18,9c,3e,63
9060 DATA 32,7,90,79,18,cd,c1,18,b,d1,3a
     ,1,90,12,1b,fd,7e,0,12,1b,dd,23,dd,
     23
9070 DATA fd,23,c,10,df,ed,53,8,90,c9,-1
'
```

Listing 2 - The Unsquash program

```
10 MEMORY &5000:location=&9200
1000 checksum=0:code$="":READ code$
1010 WHILE code$<>"-1":number=VAL("&"+code
     $)
1020 POKE location,number:location=locatio
     n+1
1030 checksum=checksum+number:READ code$:W
     END
1040 IF checksum <> 15781 THEN PRINT "Erro
     r in DATA !"
13000 '****************** UNSQUASH THE DAT
      A (Call &9200)**********************
      *
13010 DATA 3a,4,90,cd,e,bc,21,0,0,cd,5,bc,
      21,a,90,46,23,4e,23,e5,cd,38,bc,e1
13020 DATA 3e,10,f5,46,23,4e,23,e5,cd,32,b
      c,e1,f1,3d,fe,0,20,f0,21,ff,8f,dd,21
13030 DATA 0,90,11,0,c0,e,c8,d5,6,50,7e,dd
      ,be,1,28,34,dd,be,2,20,18,2b,c5,4e,2
      b
13040 DATA 7e,12,13,5,d,79,fe,0,20,f6,78,c
      1,47,2b,fe,0,20,df,18,5,12,13,2b,10
13050 DATA d8,d1,d,79,fe,0,28,25,e5,62,6b,
      cd,26,bc,54,5d,e1,18,c3,c5,2b,46,4,e
      5
13060 DATA 21,0,c0,cd,26,bc,10,fb,cd,29,bc
      ,1,50,0,ed,b0,e1,2b,c1,18,d4,2a,5,90
13070 DATA cd,5,bc,c9,-1
13080 '-----------------------------------
'
```

Listing 3 - Program to calculate the length of the file

```
10000 '******* CALCULATE START ADDRESS &
       LENGTH OF SQUASHED FILE *********
      **
10010 lsb=PEEK(&9008):msb=PEEK(&9009):re
      sult=msb*256+lsb
10020 total=36912-result:PRINT"Memory us
      ed =  ";total
10030 PRINT "Press <ENTER> to SAVE to TA
      PE"
10040 PRINT "Any other key to END"
10050 WHILE get$="":get$=INKEY$:WEND
10060 IF get$ <> CHR$(13) THEN END
10070 LINE INPUT"Enter file name ";file$
10080 SAVE "!"+file$,B,result,total
10090 '---------------------------------
```



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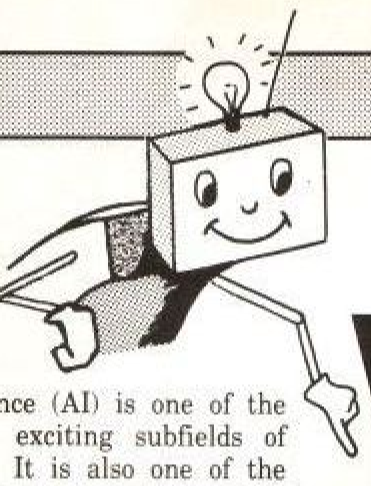
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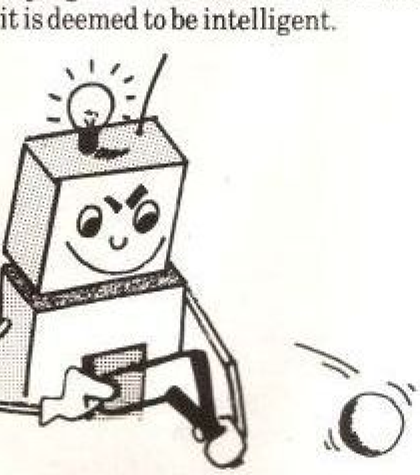
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What is AI?

Artificial Intelligence (AI) is one of the newest and most exciting subfields of Computer Science. It is also one of the hardest to define, because even the people who work in the area disagree on what it is. They all agree that they're trying to create programs which help in some way towards the goal of creating an intelligent computer, but people are still getting PhDs for trying to figure out just what that means.

The problem is that "intelligence" is a very hard concept to pin down. The original measure used in AI to gauge whether a system is intelligent or not is called the Turing Test, and it boiled down to the notion that if you present a human being with transcripts of the output of a computer program, and allow that human being to ask whatever questions they like in order to elicit new repsonses, then if the human being cannot tell whether the program is indeed a program or instead another human being, it is deemed to be intelligent.



The Turing Test is empirical in that you just provide a set of stimuli and look at the results. It may be that there is actually nothing intelligent going on at all. If, for example, Alf meets Basil, and Basil tells him the questions he'd ask if he were trying to see if a program were intelligent, then Alf goes away and writes a program which reads a line of input, throws it away, and prints out the answer to Basil's next question irrespective of what the input actually was, then if Basil were to run a Turing Test on it he'd be impressed to find it answered everything intelligently. If Connie came along, she'd like as not be very unimpressed because the answers given her would be nothing to do with the questions she asked.

So the Turing Test has its limitations. If there were a great big program in charge, though, instead of a collection of print statements, would its answering both Basil's and Connie's questions passably then be enough? It may still be nothing more than a table look-up, with a a vast amount of question/answer pairs pre-programmed in and no "reasoning" abilities at all. Ah, but now we're starting to demand other qualities of intelligence; "reasoning ability" - part of the mechanism which we think ought to be present in anything worthy of the name. Is that a valid thing to do?

Well this is where the disagreement arises. 8 out of 10 AI workers (who express a preference) say that it doesn't matter HOW we get an intelligent machine, so long as we get one. If we want a machine to fly, we don't imitate birds, we build aeroplanes; therefore if we want a machine to think, therefore, why try to mimic the human mind?

There are plenty of people who dispute this idea, though, arguing that if we already have a ready-working, intelligent machine, ie. a human being, then it would be foolhardy simply to ignore it; they point to one aspect of AI, computer vision, as a discipline which was floundering until researchers took a look at the way that "humans did it", whereupon it began to flourish.

Finally, there are those who think the whole subject of AI is a complete waste of time, because human beings ARE NOT machines, and even if they were they're made of special hardware which we don't know how to construct artifically. There are mathematical reasons why this "humans aren't machines" claim is usually laughed off by AI workers, but plenty of philosophical/theological ones which carry some weight. There are also biological reasons both for and against the "you need special hardware to run in real-time" objection..!

So the best we can say then is that if a system LOOKS intelligent, then to all intents and purposes it IS intelligent, which is, not surprisingly, back to the Turing Test. Now we come to the harder question of when it is valid to say that a program is an "AI program".



There are several rules-of-thumb which can be applied to a program to see if it's "AI", of course. A program is not AI these days if it is written in anything other than LISP or PROLOG, or if it runs on anything with less power than a minicomputer. Although these rules may seem rather arbitrary, for example there are other AI languages such as POPLOG, they are actually quite reasonable. The key phrase, though is "these days".

Take computer games like chess, for example. These days hardly anyone works in computer chess, because you almost have to be a chess expert to do so. The programs work nothing like human players at all, and when two computers play each other, the fastest usually wins. However, when these programs were originally developed, there were some key algorithms created which were of use outside chess. The main one of these, called "alpha-beta pruning", is used all over Computer Science now, whenever programs need to take "turns" to achieve opposite results. This is useful in, say, proving mathematical theorems, where one part of the system can try to prove fact P is true, and the other try to prove it's false.

So, is a program which merely uses alpha-beta pruning therefore an AI program? Before we answer, there's a harder question: an earlier algorithm which did the same as alpha-beta pruning but much more slowly was called the "Minimax" algorithm; is a program which uses minimax an "AI" program?

Hmm, that's a poser..! It really depends on the program in which it is being used. Many AI programs use complex maths, for example Expert Systems often use "Fuzzy Logic". Merely using Fuzzy Logic, however, doesn't make a program an Expert System. It depends on other factors, and in particular whether the program is intended to show some intelligence or not.

Other AI techniques are now taught in undergraduate courses on programming without reference to their origins. For some data structures, for example "trees", almost all the high-powered algorithms which manipulate them come out of AI. Many methods which involve searching for a piece of information from a large number of other, similar pieces of information came out of AI. If we were to concede that using AI techniques were a sufficient criterion for claiming a program is an AI program, then most of Data Processing is AI, too. So it is foolish to suggest that something is "AI" if it utilises methods which, although they originated in AI, are now used all over the place. Unfortunately, many of the "Artifical Intelligence on your ZippyComp-64L" books do just that. Using "AI techniques" does not mean you will necessarily be able to write AI PROGRAMS.

Neither does writing AI programs mean you'll get something with artificial intelligence at the end. AI programs are ones which demonstrate some feature of artifical intelligence, or, failing that, which try something out that will make it easier for some other program to be written to demonstrate it ("don't try doing it this way, it doesn't work..."). Most AI programs are thrown away once they've been written, because they're no longer up-to-date. They usually don't stand on their own very well, and have to be merged together or rewritten if they are to become commercial products.

That said, there are many commercial AI programs, especially "Expert Systems". These are programs which use quite modern AI software technology, and which get their intelligent behaviour from embodying knowledge from an intelligent source, ie. a human being, expert in some field. Because they actually show some semblance of intelligence, such that a non-AI person looking at it may be quite impressed, they're real "AI programs".

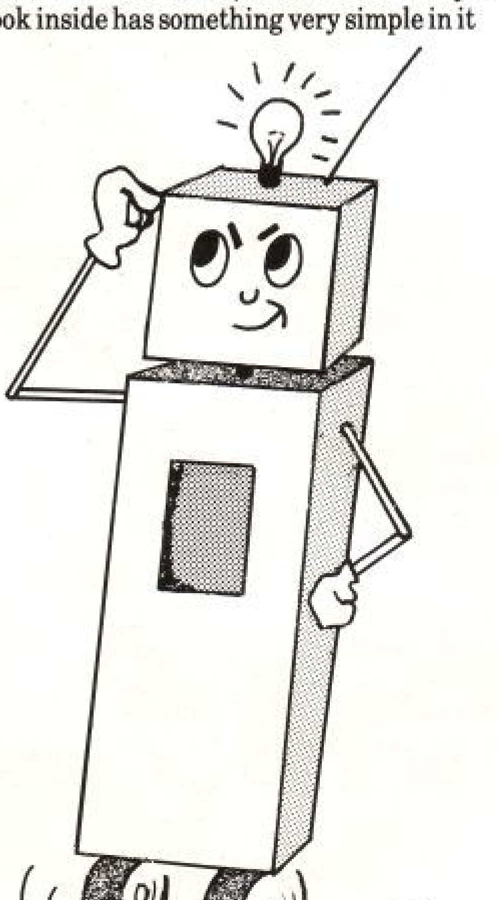
So is a program like "ELIZA" (or "DOCTOR", as it is occasionally known) an AI program? It uses an out-dated pattern-matching scheduler no longer used anywhere else in AI, and only occasionally in the rest of computing. It's certainly not state-of-the-art, but it does try to show some intelligence. Well, it certainly WAS an AI program, once, but whether it still is or not is a matter for debate. The problem is that everyone understands it, and thus it is no longer impressive unless you've never seen it before. And here we have the crux of the problem of deciding whether a program is an "AI" program or not.

You see, once people know how a program works, even at the most abstract level, they are no longer sufficiently impressed with it to endow it with the label "intelligent". If a person came up to me and said they could multiply three 6-digit numbers in their head, I might think they were intelligent; however, although a pocket calculator can do it, and many times faster, I certainly would not say it was intelligent. That's because the calculator does it automatically, and it doesn't do anything else. It's also sufficiently predictable for me to trust its answer, whereas I'd be sceptical of the answer produced by a human. Once something is predictable, it becomes "mindless", and thus non-intelligent.

So, with ELIZA, since I know how it works, I don't think it is intelligent. And, since the Turing Test has never been passed, that applies to all other AI programs, too. ELIZA itself, yes, I would concede is still probably an AI program, although systems using ELIZA-like techniques, for example "intelligent" front-ends for databases, I wouldn't call AI programs because there are much better ways to do it now than ELIZA's old mechanism.

Rewriting existing AI programs so they work on micros is fair enough, although the best you'll get is programs which have long since been superseded. Hence, be wary of books with titles like "Artificial Intelligence in OMO-BASIC/32++", because although you may get some AI techniques presented to you, it's unlikely that you'll get any but the most ancient programs. This isn't necessarily because the authors don't know any more AI than that, it's simply the pragmatics of AI programs; as the leading edge to fit onto a micro's programs which were the leading edge when the most powerful machines around were about as fast as micros are now. As for being in a language other than LISP or PROLOG, well if you want to do any serious work then you might as well forget it. AI researchers don't use these two languages just to indulge themselves, you know - they actually make things a whole lot easier.

The problem of "opening the black box" has often been noted in AI. That's where you're really excited about an AI system, and are desperate to know how it works and once you are told,how you think "is that all"? The program is a like a mythical black box which does amazing things ("put this box on your lawn, slide away the bottom, and in the morning all the grass under it will have been cut"), and which once you look inside has something very simple in it

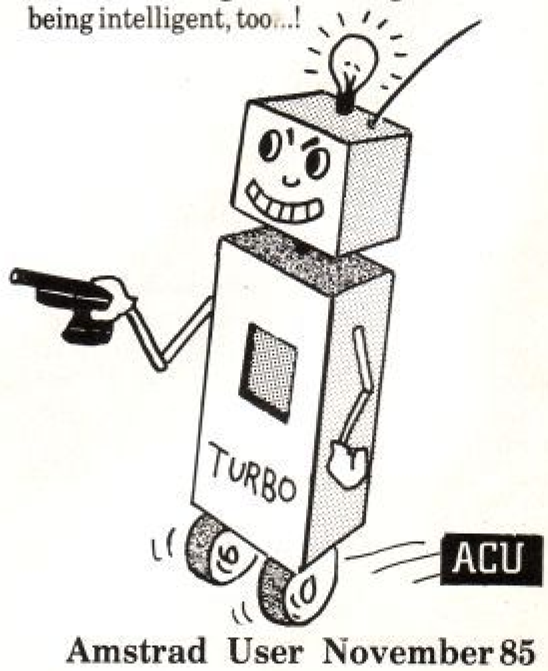


("hey, there's a rabbit in this box!"). So it is with AI programs; what seems to be intelligent immediately loses this property once you find out how it works.

AI, then, is caught up in an "advancing horizon" situation. You take one step towards your goal, and, by doing that, the goal recedes by one step. You can't win! Even if the Turing Test were passed, it would merely be altered so that is was "tighter", for example by requiring the machine to understand spoken words rather than written ones (no matter what you may see on "Knight Rider", this is WAY beyond current AI programs). The only way the Turing Test could really be passed would be if the machine were, to all intents and purposes, an exact copy of a human being; but who wants one of those when we have four thousand million real human beings already and it only takes 9 months to produce a new one?

So what, then, is AI? I've given several uses of the term, which I'll now recapitulate. An "AI technique" is an algorithm which originated in an AI program, or several AI programs. Most AI people however would pour scorn on the idea that just using these techniques makes a program an AI program. To be an "AI program" means going some way towards the ultimate end of producing artificial intelligence. This "artificial intelligence" is intelligence which is exhibited by a non-natural system, for example a computer (or, more properly, a computer program). "AI" is the area of Computing (plus a smattering of every other field of human endeavour) which tries to develop ideas and programs that will eventually contribute to the production of a machine with artifical intelligence.

And when will we know we have a truly aritificially intelligent machine? Only when we decide a system is worthy of the name. There is no "absolute" measure of intelligence, it's solely a subjective idea. The only sentient creatures we know are people, and the only people we can be certain are intelligent are ourselves. For every other person, intelligence is a property we bestow upon them based on the observation that they look like us, behave a lot like us, and, most importantly, appear to be able to think. If we are prepared to accept that a machine can appear to think, then we may be prepared to say it is therefore intelligent. Machines will only be intelligent when we say they are, because only intelligent entities can recognise other intelligent entities. Let's just hope, then, that if we ever DO manage to create an artificial intelligence, it recognises us as being intelligent, too...!



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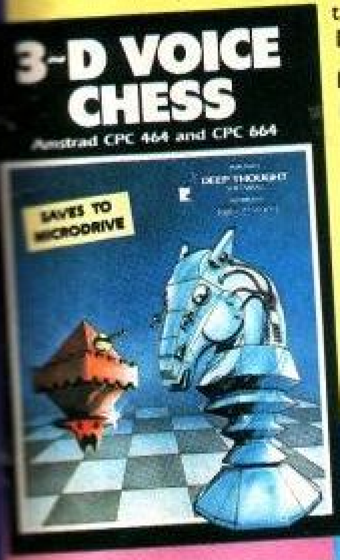
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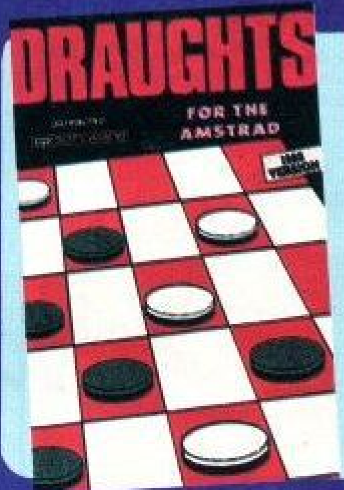
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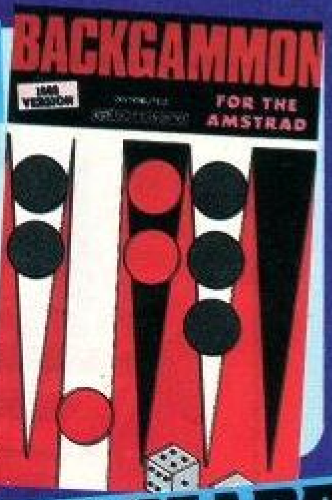
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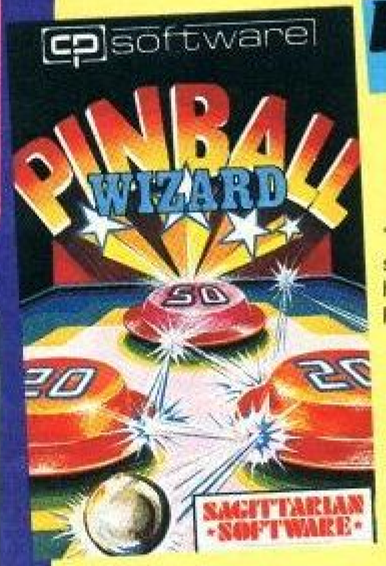
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SPLATCH!

You are a little, white rabbit; lost and hungry. You are in a garden and you can smell carrots and once you've eaten one you want more and more. The problem is that the acorns will fall on your head and the squirrels and butterflies will attack you if you don't dodge them in time. Once you have eaten all the carrots in one garden, you can move on to the other. Collect all the carrots before time runs out or you will starve.

The rabbit can be controlled by keyboard or joystick and the control keys can be defined to suit you, but they were originally set at Q, A, O, P, as Up, Down, Left and Right. The shift key always means push or eat. If you find yourself trapped in a situation on the screen, you can attempt it again by pressing 'Esc' after forfeiting a life. It is possible to complete all the screens but it will take a lot of practice; still, after typing in this lot you will have incredibly agile fingers. See if you can beat the editors' high scrore of 19,100.

Typing the programs in

There is a tremendous amount of typing to do, the game won't work until you have typed all seven parts in. This month we have listed the first two, next month we will list the other five. There are several short cuts you can use to make the job a little easier. For each of the programs lines 30 to 130 are the same, only line 115 has been altered to load the next program. This means that you only need type in the first few lines once and then merge the data lines for each new listing. You don't have to do this, you can re-type the first bit each time if you find that easier. Some of the lines are the same, notably those with lots of zeros, if you define a function key to produce the line of zeros like this:

```
KEY 135,"DATA  00,00,00,00,00,00,00,00,0"+CHR$(13)
```

You need only press one key to produce the whole line each time it is repeated. If you do this in conjunction with the AUTO command to update the line numbers, a good deal of the time taken can be cut down.

Unfortunately, there is no quick way to put the changing data in.

There is a lot of work involved in entering these programs so there is no point in scrimping on blank tapes. If you have a disc system you will probably need to use two discs, although the whole lot will fit onto one side when finished. Tape users should use eight different tapes, label them one to seven and label the eighth tape 'combination'. When you are typing in the programs save frequent back-up copies. Put each program on the appropriately numbered tape. Always save programs before before running. You can run each section individually to flush out typing



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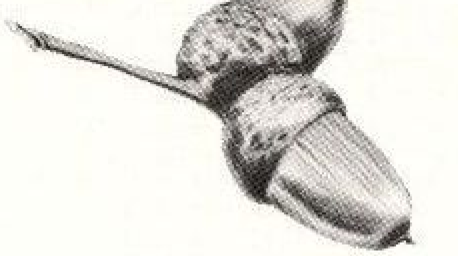
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errors and bugs but the sections won't do anything until they have been put together. When you have got all the sections working to the extent that they run through to line 115 (where the next program is loaded),it is time to put the whole lot together. There will be a detailed explanation of how to do this next month. Good luck!

Program 1

```
1 PRINT"Program 1 is running":PRINT"work
  ing on line"
7 ENT -3,1,-20,1:ENT -4,1,20,1:ENV 2,1,1
  5,10,1,-15,12
8 MEMORY 20759
10 valid$="0123456789ABCDEF":ln=1000
20 x=20760
30 FOR y=0 TO 7
40 READ num$:IF num$="***" THEN 110
50 IF INSTR(valid$,LEFT$(num$,1)) OR INS
   TR (valid$,RIGHT$(num$,1)) THEN num=V
   AL("&"+num$):POKE x+y,num ELSE 120
60 chk=chk+num
70 NEXT:ln=ln+10
80 READ check:IF chk<>check THEN 130
90 chk=0
95 PRINT ln;CHR$(11)
100 x=x+8:GOTO 30
110 PRINT"bytes=";x+y
115 RUN"program2
120 PRINT"Invalid character in line ";ln
    :END
130 PRINT"Checksum error in line ";ln:EN
    D
1000 DATA 00,00,00,00,00,00,00,00,0
1010 DATA 00,00,00,00,00,00,00,00,0
1020 DATA 00,00,00,00,00,00,00,00,0
1030 DATA 00,00,00,00,00,00,00,00,0
1040 DATA 00,00,00,00,00,00,00,00,0
1050 DATA 00,00,00,00,00,00,00,00,0
1060 DATA 00,00,00,00,00,00,00,00,0
1070 DATA 00,00,00,00,00,06,00,00,0
1080 DATA 00,0C,03,03,03,03,0C,03,39
1090 DATA 03,0F,0F,0F,0F,0F,0F,0B,104
1100 DATA 0E,0F,0E,03,09,0C,0F,0C,94
1110 DATA 07,0F,0F,0F,0F,0F,4D,0F,174
1120 DATA 4C,0F,0F,03,23,99,8F,0C,452
1130 DATA 0F,2E,17,0F,23,0F,4F,0F,243
1140 DATA 4C,CC,0C,CC,0F,00,BF,13,721
1150 DATA 4C,6F,2F,00,23,03,CF,0C,491
1160 DATA 00,33,88,00,00,EE,EE,00,663
1170 DATA 11,98,73,00,11,00,F1,00,542
1180 DATA 33,50,71,88,22,20,F0,88,822
1190 DATA 22,50,F0,88,22,20,F0,88,932
1200 DATA 67,58,C3,CC,45,07,0D,44,747
1210 DATA 46,0A,0A,4C,23,05,05,88,347
1220 DATA 77,8A,3B,00,47,EF,EE,00,864
1230 DATA 77,0F,2E,00,11,FF,EE,00,690
1240 DATA 00,44,99,00,00,22,AA,00,425
1250 DATA 00,11,CC,00,00,77,FF,00,595
1260 DATA 00,E9,3C,88,00,9E,C3,88,918
1270 DATA 00,CF,1F,88,00,47,1F,00,476
1280 DATA 00,47,1F,00,00,67,3F,00,268
1290 DATA 00,23,2E,00,00,23,2E,00,162
1300 DATA 00,33,6E,00,00,11,4C,00,254
1310 DATA 00,11,4C,00,00,00,88,00,229
1320 DATA 00,77,EE,00,11,CF,F3,88,960
1330 DATA 33,C3,C3,CC,67,C3,0F,6E,1068
1340 DATA 47,0F,3C,2E,CF,0F,3C,3F,537
1350 DATA BC,0F,0F,79,FF,FC,F3,FF,1344
1360 DATA 00,74,E2,00,00,47,E2,00,639
1370 DATA 00,74,E2,00,00,56,E2,00,654
1380 DATA 22,56,E2,44,99,74,E2,88,1045
1390 DATA 55,FC,F3,AA,33,FF,FF,CC,1515
1400 DATA 00,00,70,00,00,00,42,00,178
1410 DATA 00,00,42,00,00,00,F0,80,434
1420 DATA 00,00,D3,E0,00,00,F0,F0,915
1430 DATA 00,00,70,E0,00,70,F0,80,816
1440 DATA 10,F0,F0,C0,30,F0,F0,C0,1408
1450 DATA 30,F0,F0,80,70,FE,F0,80,1390
1460 DATA FC,F1,F0,00,FC,F1,F0,80,1594
1470 DATA 70,E2,10,C0,30,F0,80,C0,1154
1480 DATA 00,E0,00,00,00,24,00,00,260
1490 DATA 00,24,00,00,10,F0,00,00,292
1500 DATA 70,BC,00,00,F0,F0,00,00,780
1510 DATA 70,E0,00,00,10,F0,E0,00,816
1520 DATA 30,F0,F0,80,30,F0,F0,C0,1376
1530 DATA 10,F0,F0,C0,10,F0,F7,E0,1415
1540 DATA 00,F0,F8,F3,10,F0,F8,F3,1478
1550 DATA 30,80,74,E0,30,10,F0,C0,1012
1560 DATA FF,9F,1F,EE,8F,9F,1F,EE,1254
1570 DATA 8F,8F,9F,3F,8F,4F,9F,1F,920
1580 DATA CF,7F,0F,9F,47,9F,0F,9F,912
1590 DATA 47,9F,0F,BF,47,8F,1F,AE,855
1600 DATA 47,1F,1F,2E,47,1F,3F,2E,390
1610 DATA 47,2F,AF,3F,CF,9F,2F,1F,800
1620 DATA 8F,9F,4F,1F,CF,8F,4F,1F,872
1630 DATA 57,0F,2F,3F,57,2F,2F,2E,439
1640 DATA 00,00,03,08,00,01,03,0C,27
1650 DATA 00,03,03,0C,01,0F,01,0C,47
1660 DATA 07,CB,01,0E,0F,0F,00,0E,269
1670 DATA 07,0E,00,06,01,0F,0C,07,62
1680 DATA 03,0F,0F,03,03,0F,0F,0B,80
1690 DATA 01,0F,0F,0F,01,0F,7F,0F,204
1700 DATA 00,0F,8F,0F,01,0F,8F,0F,347
1710 DATA 03,08,8F,0E,20,10,87,0C,363
1720 DATA 01,0C,00,00,03,0C,08,00,36
1730 DATA 03,0C,0C,00,03,08,0F,08,61
1740 DATA 07,08,3D,0E,07,00,0F,0F,127
1750 DATA 06,00,07,0E,0E,03,0F,08,67
1760 DATA 0C,0F,0F,0C,0D,0F,0F,0C,109
1770 DATA 0F,0F,0F,08,0F,EF,0F,08,330
1780 DATA 0F,1F,0F,00,0F,1F,0F,08,130
1790 DATA 07,1F,01,0C,03,1E,80,40,276
1800 DATA 00,44,22,00,0E,44,22,07,225
1810 DATA 0F,02,04,0F,0F,0A,05,0F,81
1820 DATA 48,09,09,21,E0,0D,0B,70,483
1830 DATA 70,07,0E,E0,30,CF,3F,C0,867
1840 DATA 11,EF,7F,88,33,C1,38,CC,1023
1850 DATA 77,C1,38,EE,76,C1,38,E6,1203
1860 DATA FE,80,10,F7,FC,80,10,F3,1284
1870 DATA FC,80,10,F3,F8,00,00,F1,1128
1880 DATA 01,44,22,08,01,4C,23,08,231
1890 DATA 01,0A,05,08,10,0A,05,80,183
1900 DATA 10,0D,09,80,10,0D,0B,80,334
1910 DATA 00,87,1E,00,00,CF,3F,00,435
1920 DATA 11,EF,7F,88,11,C9,39,88,930
1930 DATA 11,C9,39,88,11,C9,39,88,822
1940 DATA 11,C8,31,88,11,C0,30,88,795
1950 DATA 11,80,10,88,11,80,10,88,594
1960 DATA 00,00,00,00,00,00,00,00,0
1970 DATA 00,00,00,00,00,00,00,00,0
1980 DATA 00,00,00,00,00,00,00,00,0
1990 DATA 00,00,00,00,00,00,00,00,0
2000 DATA 00,00,00,00,00,00,00,00,0
2010 DATA 00,00,00,00,00,00,00,00,0
2020 DATA 00,00,00,00,00,00,00,00,0
2030 DATA 00,00,00,00,00,00,00,00,0
2040 DATA 00,22,00,22,89,2B,0C,44,328
2050 DATA 45,0D,0C,0E,01,0C,0D,0F,149
2060 DATA 00,0E,0D,0F,06,07,0F,0E,84
2070 DATA 07,47,2F,7F,CF,2F,4F,0E,599
2080 DATA 03,0F,4F,0E,11,8F,1F,07,309
2090 DATA 27,0F,0E,8F,0F,0F,0F,03,259
2100 DATA 0F,47,0F,08,06,8F,8B,08,405
2110 DATA 22,07,8F,44,44,02,06,22,362
2120 DATA 00,00,00,00,00,00,00,00,0
2130 DATA 00,00,00,00,00,00,00,00,0
2140 DATA 00,00,00,00,00,00,00,00,0
2150 DATA 00,00,00,00,00,00,00,00,0
2160 DATA 00,00,00,00,00,00,00,00,0
2170 DATA 00,00,00,00,00,00,00,00,0
2180 DATA 00,00,00,00,00,00,00,00,0
```



```
2190 DATA 00,00,00,00,00,00,00,00,0
2200 DATA 00,00,00,00,00,00,00,00,0
2210 DATA 00,00,00,00,00,00,00,00,0
2220 DATA 00,00,00,00,00,00,00,00,0
2230 DATA 00,00,00,00,00,00,00,00,0
2240 DATA 00,00,00,00,00,00,00,00,0
2250 DATA CD,19,BD,FB,76,F3,C3,67,1329
2260 DATA 5B,00,00,00,C1,01,00,00,285
2270 DATA 00,0F,0F,FF,FF,43,68,6F,822
2280 DATA 6F,73,65,09,28,4A,29,6F,602
2290 DATA 79,73,74,69,63,6B,20,6F,806
2300 DATA 72,20,28,4B,29,65,79,62,622
2310 DATA 6F,61,72,64,2E,20,20,20,564
2320 DATA 20,20,20,20,20,53,4F,4D,399
2330 DATA 45,4F,4E,45,20,4D,4F,44,551
2340 DATA 45,53,54,2E,20,20,20,20,410
2350 DATA 20,20,20,20,20,20,20,20,256
2360 DATA 20,20,20,20,20,20,20,20,256
2370 DATA 20,20,20,20,44,45,46,49,408
2380 DATA 4E,45,09,4B,45,59,53,3A,530
2390 DATA 2D,20,20,20,20,20,20,20,269
2400 DATA 20,20,20,20,20,20,20,20,256
2410 DATA 20,20,20,20,20,20,20,20,256
2420 DATA 20,20,20,20,55,50,20,20,357
2430 DATA 20,3A,2D,20,20,20,20,20,295
2440 DATA 20,20,20,20,20,20,20,20,256
2450 DATA 20,20,20,20,20,20,20,20,256
2460 DATA 20,20,20,20,20,20,20,20,256
2470 DATA 20,20,20,20,44,4F,57,4E,440
2480 DATA 20,3A,2D,20,20,20,20,20,295
2490 DATA 20,20,20,20,20,20,20,20,256
2500 DATA 20,20,20,20,20,20,20,20,256
2510 DATA 20,20,20,20,20,20,20,20,256
2520 DATA 20,20,20,20,4C,45,46,54,427
2530 DATA 20,3A,2D,20,20,20,20,20,295
2540 DATA 20,20,20,20,20,20,20,20,256
2550 DATA 20,20,20,20,20,20,20,20,256
2560 DATA 20,20,20,20,20,20,20,20,256
2570 DATA 20,20,20,20,52,49,47,48,426
2580 DATA 54,3A,2D,20,20,20,20,20,347
2590 DATA 20,20,20,20,20,20,20,20,256
2600 DATA 20,20,20,20,20,20,20,20,256
2610 DATA 20,20,20,20,20,20,20,20,256
2620 DATA 20,20,20,20,20,20,20,20,256
2630 DATA 20,20,20,20,41,52,45,20,376
2640 DATA 54,48,45,53,45,20,43,4F,555
2650 DATA 52,52,45,43,54,20,28,59,545
2660 DATA 2F,4E,29,3F,20,20,20,20,357
2670 DATA 20,20,20,20,57,45,4C,4C,436
2680 DATA 20,44,4F,4E,45,21,47,45,499
2690 DATA 54,20,52,45,41,44,59,50,569
2700 DATA 55,53,48,20,53,50,41,43,567
2710 DATA 45,20,54,4F,20,53,54,41,528
2720 DATA 52,54,0A,20,20,20,20,20,336
2730 DATA 53,43,52,45,45,4E,3A,2D,551
2740 DATA 02,02,00,00,00,02,0D,FF,274
2750 DATA FF,04,02,03,00,02,00,0F,281
2760 DATA FF,FF,04,02,04,00,01,00,521
2770 DATA 0F,FF,FF,02,01,00,01,0E,543
2780 DATA FF,03,00,53,43,4F,52,45,638
2790 DATA 3A,2D,30,30,30,30,30,30,391
2800 DATA 20,20,20,20,20,20,20,20,256
2810 DATA 20,20,20,20,20,20,20,20,256
2820 DATA 20,20,30,30,20,20,20,20,288
2830 DATA 30,30,20,54,49,4D,45,20,463
2840 DATA 3A,2D,30,30,30,30,30,20,375
2850 DATA 20,20,20,20,20,20,20,20,256
2860 DATA 20,20,20,20,20,20,20,20,256
2870 DATA 20,20,20,20,20,20,20,20,256
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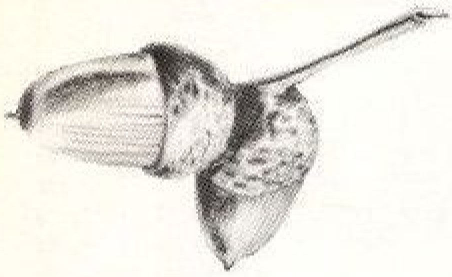
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2880 DATA 20,20,20,00,00,00,00,00,96
2890 DATA 00,00,01,00,00,0A,0A,0A,31
2900 DATA 0A,0A,0A,0A,0A,0A,20,20,124
2910 DATA 20,20,20,20,53,50,4C,41,432
2920 DATA 54,43,48,20,20,20,20,20,383
2930 DATA 20,20,20,20,20,20,20,20,256
2940 DATA 20,20,20,20,20,20,20,20,256
2950 DATA 20,20,20,20,20,20,20,20,256
2960 DATA 20,20,20,20,20,20,20,20,256
2970 DATA 20,20,20,20,20,20,20,20,256
2980 DATA 20,20,20,20,20,20,20,20,256
2990 DATA 20,42,59,20,52,4F,42,4F,525
3000 DATA 53,4F,46,54,20,20,20,20,444
3010 DATA 20,20,20,20,20,20,20,20,256
3020 DATA 20,20,20,20,20,20,20,20,256
3030 DATA 20,20,20,20,20,20,20,20,256
3040 DATA 20,20,20,20,20,20,20,20,256
3050 DATA 20,20,20,20,20,0A,0A,20,212
3060 DATA 20,20,20,20,20,20,20,20,256
3070 DATA 20,20,20,20,20,20,20,4F,303
3080 DATA 50,54,49,4F,4E,53,20,20,541
3090 DATA 20,20,20,20,20,20,20,20,256
3100 DATA 20,20,20,20,20,20,20,20,256
3110 DATA 20,20,20,20,20,20,20,20,256
3120 DATA 20,20,20,20,20,20,20,5F,319
3130 DATA 5F,5F,5F,5F,5F,5F,20,20,634
3140 DATA 20,20,20,20,20,20,20,20,256
3150 DATA 20,20,20,20,20,20,20,0A,234
3160 DATA 0A,0A,0A,20,20,20,20,20,190
3170 DATA 20,20,20,20,31,20,3A,20,299
3180 DATA 50,4C,41,59,20,54,48,45,567
3190 DATA 20,47,41,4D,45,0D,0A,0A,347
3200 DATA 0A,0A,20,20,20,20,20,20,212
3210 DATA 20,20,20,32,20,3A,20,43,335
3220 DATA 48,41,4E,47,45,20,43,4F,533
3230 DATA 4E,54,52,4F,4C,53,0D,0A,505
3240 DATA 0A,0A,0A,20,20,20,20,20,190
3250 DATA 20,20,20,20,33,20,3A,20,301
3260 DATA 43,48,41,4E,47,45,20,53,537
3270 DATA 54,41,52,54,20,53,43,52,579
3280 DATA 45,45,4E,FF,FF,00,00,00,726
3290 DATA 00,00,00,00,00,00,00,00,0
3300 DATA 00,00,00,00,00,00,00,00,0
3310 DATA 00,00,00,00,00,00,00,00,0
3320 DATA 00,00,00,00,00,00,00,00,0
3330 DATA 00,00,00,00,00,00,00,00,0
3340 DATA 00,00,00,00,00,00,00,00,0
3350 DATA 00,00,00,00,00,00,00,00,0
3360 DATA 00,00,00,00,00,00,00,00,0
3370 DATA 00,00,00,00,00,00,00,64,100
3380 DATA 04,04,00,00,00,00,00,00,8
3390 DATA 00,00,00,00,00,00,00,00,0
3400 DATA 00,00,00,00,00,00,00,00,0
3410 DATA 00,00,00,00,00,00,00,00,0
3420 DATA 00,00,00,00,00,00,00,00,0
3430 DATA 00,00,00,00,00,00,00,00,0
3440 DATA 00,00,00,00,00,00,00,00,0
3450 DATA 00,00,00,00,00,00,00,00,0
3460 DATA 00,00,00,00,00,00,00,00,0
3470 DATA 00,00,00,00,00,00,00,00,0
3480 DATA 00,00,00,00,00,00,00,00,0
3490 DATA 00,00,00,00,00,00,00,00,0
3500 DATA 00,00,00,00,00,00,00,00,0
3510 DATA 00,00,00,00,00,00,00,00,0
3520 DATA 00,00,00,00,00,00,00,00,0
3530 DATA 00,00,00,00,00,00,00,00,0
3540 DATA 00,00,00,00,00,00,00,00,0
3550 DATA 00,00,00,00,00,00,00,00,0
3560 DATA 00,00,00,00,00,00,00,00,0
3570 DATA 00,00,00,00,00,00,00,00,0
3580 DATA 00,00,00,00,00,00,00,00,0
3590 DATA 00,00,00,00,00,00,00,00,0
3600 DATA 00,00,00,00,00,00,00,00,0
3610 DATA 00,00,00,00,00,00,00,00,0
3620 DATA 00,00,00,00,00,00,00,00,0
3630 DATA 00,00,00,00,00,00,00,00,0
3640 DATA 00,00,00,00,00,00,00,00,0
3650 DATA 00,00,00,00,00,00,00,00,0
3660 DATA 00,00,00,00,00,00,00,00,0
```



```
3670 DATA 00,00,00,00,00,00,00,00,0
3680 DATA 00,00,00,00,00,00,00,00,0
3690 DATA 00,00,00,00,00,00,00,00,0
3700 DATA 00,00,00,00,00,00,00,00,0
3710 DATA 00,00,00,00,00,00,00,00,0
3720 DATA 00,00,00,00,00,00,00,00,0
3730 DATA 00,00,00,00,00,00,00,00,0
3740 DATA 00,00,00,00,00,00,00,00,0
3750 DATA 00,00,00,00,00,00,00,00,0
3760 DATA 00,00,00,00,00,00,00,00,0
3770 DATA 00,00,00,00,00,00,00,00,0
3780 DATA 00,00,00,00,00,00,00,00,0
3790 DATA 00,00,00,00,00,00,00,00,0
3800 DATA 00,00,00,00,00,00,00,00,0
3810 DATA 00,00,00,00,00,00,00,00,0
3820 DATA 00,00,00,00,00,00,00,00,0
3830 DATA 00,00,00,00,00,00,00,00,0
3840 DATA 00,00,00,00,00,00,00,00,0
3850 DATA 00,00,00,00,00,00,00,00,0
3860 DATA 00,00,00,00,00,00,00,00,0
3870 DATA 00,00,00,00,00,00,00,00,0
3880 DATA 00,00,00,00,00,00,00,00,0
3890 DATA 00,00,00,00,00,00,00,00,0
3900 DATA 00,00,00,00,00,00,00,00,0
3910 DATA 00,00,00,00,00,00,00,00,0
3920 DATA 00,00,00,00,00,00,00,00,0
3930 DATA 00,00,00,00,00,00,00,00,0
3940 DATA 00,00,00,00,00,00,00,00,0
3950 DATA 00,00,00,00,00,00,00,00,0
3960 DATA 00,00,00,00,00,00,00,00,0
3970 DATA 00,00,00,00,00,00,00,00,0
3980 DATA 00,00,00,00,00,00,00,00,0
3990 DATA 00,00,00,00,00,00,00,00,0
4000 DATA 00,00,00,00,00,00,00,00,0
4010 DATA 00,00,00,00,00,00,00,00,0
4020 DATA 00,00,03,00,30,30,30,30,195
4030 DATA 30,00,00,00,00,00,00,20,80
4040 DATA 55,53,45,20,53,50,41,43,564
4050 DATA 45,20,54,4F,20,53,45,4C,524
4060 DATA 45,43,54,20,53,54,41,52,566
4070 DATA 54,20,53,43,52,45,45,4E,564
4080 DATA 20,54,48,45,4E,20,20,20,431
4090 DATA 50,52,45,53,53,20,27,45,537
4100 DATA 4E,54,45,52,27,20,54,4F,547
4110 DATA 20,43,4F,4E,54,49,4E,55,576
4120 DATA 45,2E,20,20,20,20,20,20,307
4130 DATA 20,20,20,20,20,20,20,20,256
4140 DATA 53,54,41,52,54,20,53,43,580
4150 DATA 52,45,45,4E,3A,2D,20,20,465
4160 DATA 20,20,20,20,20,20,20,20,256
4170 DATA 20,20,20,20,20,20,20,44,292
4180 DATA 20,45,20,4D,20,4F,20,20,385
4190 DATA 20,20,20,20,20,20,20,20,256
4200 DATA 20,20,20,20,20,20,20,20,256
4210 DATA 20,20,20,20,20,20,20,20,256
4220 DATA 20,20,20,20,20,20,20,4D,301
4230 DATA 20,4F,20,44,20,45,20,20,376
4240 DATA 20,20,20,20,20,20,20,20,256
4250 DATA 20,20,20,20,20,20,20,21,257
4260 DATA 13,25,20,16,16,28,20,20,236
4270 DATA 14,20,10,06,17,03,08,18,132
4280 DATA 06,09,10,25,13,35,15,10,177
4290 DATA 06,00,00,00,00,00,00,3E,68
4300 DATA 04,CD,5A,BB,3E,01,CD,5A,844
4310 DATA BB,CD,C7,5B,21,8C,5A,11,962
4320 DATA 8D,5A,01,04,00,36,00,ED,527
4330 DATA B0,CD,A2,76,CD,AE,78,CD,1365
4340 DATA B4,5C,CD,02,77,21,8C,5A,861
4350 DATA 11,8D,5A,01,04,00,36,00,307
4360 DATA ED,B0,CD,AE,78,CD,09,BB,1313
4370 DATA DA,87,5B,CD,9F,66,FB,76,1279
4380 DATA 76,F3,C3,74,5B,F1,CD,06,1215
4390 DATA BB,3E,02,CD,0E,BC,21,02,693
4400 DATA 10,CD,3F,BB,3E,01,CD,90,883
4410 DATA BB,3E,00,CD,96,BB,C9,3E,1054
4420 DATA 0C,CD,5A,BB,AF,32,61,5B,907
4430 DATA 32,62,5B,32,FB,56,21,8C,799
4440 DATA 5A,11,8D,5A,01,04,00,36,397
4450 DATA 30,ED,B0,21,F9,58,11,FA,1098
4460 DATA 58,36,04,01,2C,01,ED,B0,605
4470 DATA 3E,03,32,8A,5A,AF,32,8B,707
4480 DATA 5A,CD,AE,62,3E,01,21,A3,826
4490 DATA 56,CD,BC,BC,21,01,10,CD,922
5000 DATA ***
```

Program 2

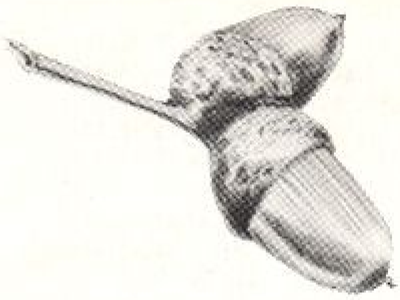
```
5 REM program 2
6 PRINT"program 2 is running":PRINT"Work
  ing on line"
10 valid$="0123456789ABCDEF":ln=4500
20 x=23560
30 FOR y=0 TO 7
40 READ num$:IF num$="***" THEN 110
50 IF INSTR(valid$,LEFT$(num$,1)) OR INS
   TR (valid$,RIGHT$(num$,1)) THEN num=V
   AL("&"+num$):POKE x+y,num ELSE 120
60 chk=chk+num
70 NEXT:ln=ln+10
80 READ check:IF chk<>check THEN 130
90 chk=0
95 PRINT ln;CHR$(11)
100 x=x+8:GOTO 30
110 PRINT"bytes=";x+y
115 RUN"program3
120 PRINT"Invalid character in line ";ln
    :END
130 PRINT"Checksum error in line ";ln:EN
    D
4500 DATA 3F,BB,3E,03,CD,90,BB,3E,913
4510 DATA 00,CD,96,BB,C9,7E,CD,5A,1164
4520 DATA BB,23,10,F9,C9,7E,FE,FF,1323
4530 DATA C8,23,CD,5A,BB,C3,1D,5C,1033
4540 DATA 0E,0A,21,F4,C0,06,12,1A,543
4550 DATA C5,E6,0F,FE,09,CA,F9,64,1256
4560 DATA FE,0C,CA,E9,64,FE,06,C2,1255
4570 DATA 54,5C,4F,3A,89,5A,A7,CA,909
4580 DATA 4F,5C,3E,0C,C3,54,5C,41,681
4590 DATA 3A,8B,5A,80,D5,CD,53,61,1013
4600 DATA D1,13,C1,10,D2,D5,11,58,965
4610 DATA 00,19,D1,13,13,0D,C2,2D,524
4620 DATA 5C,C9,3E,01,CD,96,BB,3E,960
4630 DATA 1A,CD,5A,BB,3E,0A,CD,5A,875
4640 DATA BB,3E,1E,CD,5A,BB,3E,0A,833
4650 DATA CD,5A,BB,3E,0F,CD,5A,BB,1041
4660 DATA 3E,0C,CD,5A,BB,06,64,21,695
4670 DATA 05,57,CD,15,5C,3E,1A,CD,703
4680 DATA 5A,BB,3E,00,CD,5A,BB,3E,883
4690 DATA 50,CD,5A,BB,3E,00,CD,5A,919
4700 DATA BB,3E,19,CD,5A,BB,3E,00,818
4710 DATA CD,96,BB,C9,3E,0C,CD,5A,1112
4720 DATA BB,CD,D6,62,21,46,67,06,916
4730 DATA A0,CD,15,5C,21,85,57,CD,936
4740 DATA 1D,5C,CD,AE,62,11,00,00,615
4750 DATA ED,53,0A,55,CD,09,BB,FE,1070
4760 DATA 31,CA,36,5D,FE,32,CA,12,922
4770 DATA 60,FE,33,CA,F6,5C,ED,5B,1269
4780 DATA 0A,55,1B,ED,53,0A,55,7A,659
4790 DATA A7,C8,C3,D4,5C,C9,CD,D6,1486
4800 DATA 62,3E,0C,CD,5A,BB,21,0C,699
4810 DATA 01,CD,75,BB,21,97,5A,06,790
4820 DATA 5F,CD,15,5C,CD,AE,62,3A,948
4830 DATA 85,58,C6,41,CD,5A,BB,3E,1028
4840 DATA 08,CD,5A,BB,CD,09,BB,FE,1145
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4850 DATA 0D,CA,B4,5C,FE,20,C2,0F,982
4860 DATA 5D,3A,85,58,C6,04,E6,0F,819
4870 DATA 32,85,58,C3,0F,5D,CD,A7,946
4880 DATA BC,CD,C7,5B,3E,03,32,8A,936
4890 DATA 5A,3A,85,58,32,84,58,CD,844
4900 DATA CC,63,CD,AE,62,21,F9,58,1150
4910 DATA 11,FA,58,01,8F,01,36,04,558
4920 DATA ED,B0,21,10,81,11,F9,58,945
4930 DATA 01,DC,00,ED,B0,06,09,48,721
4940 DATA CD,38,BC,AF,32,FB,56,21,1044
4950 DATA F9,58,3E,06,01,FF,00,ED,898
4960 DATA B1,11,F9,58,A7,ED,52,7D,1142
4970 DATA 3D,32,87,58,3E,0C,CD,5A,703
4980 DATA BB,3A,84,58,5F,16,00,21,615
4990 DATA 47,5B,19,7E,27,32,62,5B,591
5000 DATA AF,32,61,5B,3E,00,CD,0E,694
5010 DATA BC,21,0C,06,CD,75,BB,21,781
5020 DATA 5E,56,06,09,CD,15,5C,21,546
5030 DATA 0E,01,CD,75,BB,21,67,56,746
5040 DATA 06,23,CD,15,5C,3A,84,58,637
5050 DATA C6,41,CD,5A,BB,CD,09,BB,1146
5060 DATA FE,20,CA,E4,5D,3A,83,58,1086
5070 DATA 3C,32,83,58,47,48,3E,03,537
5080 DATA CD,32,BC,CD,19,BD,CD,19,1092
5090 DATA BD,C3,C5,5D,3E,01,CD,0E,956
5100 DATA BC,CD,D6,62,CD,87,61,CD,1347
5110 DATA EF,62,AF,32,89,5A,11,0D,819
5120 DATA 59,CD,28,5C,CD,AE,62,FB,1154
5130 DATA CD,7C,5F,CD,56,5E,3A,96,1017
5140 DATA 5A,EE,01,32,96,5A,11,0D,649
5150 DATA 59,CD,28,5C,3E,07,CD,B3,879
5160 DATA BC,CD,09,BB,32,83,58,FE,1112
5170 DATA FC,CA,31,5E,CD,03,BB,CD,1197
5180 DATA 85,63,3A,89,5A,A7,CA,00,886
5190 DATA 5E,06,33,3E,0A,CD,5A,BB,705
5200 DATA 76,76,76,76,E5,Ei,10,F3,1185
5210 DATA 3E,01,CD,0E,BC,AF,32,89,832
5220 DATA 5A,3A,8A,5A,3D,FE,FF,C8,1146
5230 DATA 32,8A,5A,C3,5A,5D,16,0B,689
5240 DATA 1E,14,21,D5,59,E5,D5,7B,950
5250 DATA 7E,FE,B2,C2,6B,5E,36,42,1073
5260 DATA C3,A6,5E,FE,A2,C2,75,5E,1276
5270 DATA 36,42,C3,A6,5E,E6,40,C2,1063
5280 DATA C7,5E,7E,FE,22,CA,97,65,1161
5290 DATA FE,12,CA,A5,65,FE,82,CA,1326
5300 DATA B3,65,FE,32,CA,CB,65,7E,1216
5310 DATA FE,02,CA,B4,5E,FE,03,CA,1191
5320 DATA B4,5E,E6,0F,FE,08,CA,2C,1027
5330 DATA 64,FE,0B,CA,D0,65,D1,E1,1310
5340 DATA 2B,1D,C2,5D,5E,1E,14,15,524
5350 DATA C2,5D,5E,C9,01,14,00,09,612
5360 DATA 7E,E6,7F,C2,36,5F,CB,FE,1283
5370 DATA ED,42,CB,F6,C3,A6,5E,CB,1410
5380 DATA B6,7E,5F,36,00,01,14,00,478
5390 DATA 09,7E,E6,0E,FE,08,CA,14,863
5400 DATA 65,FE,0A,CA,8E,66,FE,0C,1077
5410 DATA CA,8E,66,FE,06,CA,D7,61,1220
5420 DATA 7E,E6,7F,CA,F4,5E,ED,42,1326
5430 DATA 73,C3,A6,5E,7B,77,09,7E,947
5440 DATA FE,06,CA,15,5F,E6,0E,FE,1076
5450 DATA 08,CA,15,5F,FE,0A,CA,15,813
5460 DATA 5F,FE,0C,CA,15,5F,7E,A7,972
5470 DATA C2,1C,5F,CB,FE,ED,42,CB,1280
5480 DATA F6,C3,A6,5E,D1,D5,E5,3E,1414
5490 DATA 81,32,0C,55,ED,5F,E6,07,845
5500 DATA C6,04,32,11,55,21,0C,55,484
5510 DATA CD,AA,BC,C3,47,62,4D,44,1072
5520 DATA 7E,FE,01,CA,A6,5E,FE,06,1103
5530 DATA CA,A6,5E,23,7E,A7,C2,61,1081
5540 DATA 5F,11,14,00,ED,52,7E,A7,744
5550 DATA C2,61,5F,2B,7E,36,00,CB,812
5560 DATA F7,23,77,19,CB,FF,C3,A6,1245
5570 DATA 5E,11,14,00,60,69,2B,7E,501
5580 DATA A7,C2,A6,5E,ED,52,7E,A7,1233
5590 DATA C2,A6,5E,23,7E,36,00,2B,712
5600 DATA 77,C3,A6,5E,21,F9,58,3A,1002
5610 DATA 87,58,5F,16,00,19,3A,65,524
5620 DATA 5B,A7,CA,AC,5F,E5,CD,24,1197
5630 DATA BB,E1,32,66,5B,E6,0F,FE,1154
5640 DATA 01,CA,CC,5F,FE,02,CA,C6,1158
5650 DATA 5F,FE,04,CA,DD,5F,FE,08,1133
5660 DATA CA,D2,5F,C9,3A,83,58,E6,1215
5670 DATA DF,FE,41,CA,C6,5F,FE,50,1371
5680 DATA CA,D2,5F,FE,4F,CA,DD,5F,1358
5690 DATA FE,51,CA,CC,5F,C9,11,14,1074
5700 DATA 00,C3,E4,5F,11,EC,FF,C3,1221
5710 DATA E4,5F,11,01,00,3E,FF,32,708
5720 DATA 8B,5A,C3,E4,5F,11,FF,FF,1274
5730 DATA AF,32,8B,5A,19,3A,65,5B,729
5740 DATA A7,CA,F7,5F,3A,66,5B,E6,1192
5750 DATA 10,C2,2C,61,C3,FF,5F,3A,954
5760 DATA 83,58,E6,20,CA,2C,61,7E,950
5770 DATA A7,CA,1A,61,FE,01,CA,10,965
5780 DATA 61,FE,03,CA,04,63,C3,3B,913
5790 DATA 61,C9,AF,32,65,5B,CD,D6,1134
5800 DATA 62,3E,0C,CD,5A,BB,21,0C,699
5810 DATA 05,CD,75,BB,21,15,55,06,659
5820 DATA 28,CD,15,5C,CD,AE,62,CD,1040
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5970 DATA 5F,B8,CA,49,60,3A,BC,5F,991
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6060 DATA 60,3E,3F,CD,5A,BB,3E,08 773
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6080 DATA 5F,47,E6,E0,CA,E9,60,78,1271
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6360 DATA 01,36,0D,32,89,5A,C3,A6,706
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6400 DATA CB,3F,CB,3F,CB,3F,C6,30,1044
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6450 DATA 3F,CB,3F,C6,30,CD,5A,BB,1057
6460 DATA 3A,61,5B,E6,0F,C6,30,CD,942
6470 DATA 5A,BB,C9,60,69,11,14,00,716
6480 DATA A7,ED,52,7E,E6,80,CA,61,1269
6490 DATA 5F,32,89,5A,C3,A6,5E,E1,1052
6500 DATA 5D,54,01,EC,FF,23,7E,FE,1084
6510 DATA 06,C2,60,62,09,7E,A7,C2,890
6520 DATA 61,62,2B,36,22,C3,A6,5E,781
6530 DATA A7,62,6B,2B,7E,FE,06,C2,995
6540 DATA 76,62,09,7E,A7,C2,A6,5E,972
6550 DATA 23,36,12,C3,A6,5E,C3,A6,923
6560 DATA 5E,C2,A6,5E,09,7E,FE,06,943
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6580 DATA A6,5E,21,20,C0,06,05,AF,703
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6630 DATA 48,CD,38,BC,3E,00,06,09,598
6640 DATA 0E,09,CD,32,BC,06,1A,48,570
6650 DATA 3E,01,CD,32,BC,3E,02,06,576
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6670 DATA 00,48,CD,32,BC,C9,3E,01,779
6680 DATA 06,09,48,CD,32,BC,3E,02,594
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6880 DATA 32,8D,5A,3A,8C,5A,3C,32,679
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6970 DATA CD,5A,BB,78,E6,0F,C6,30,1093
6980 DATA CD,5A,BB,C9,3A,84,58,21,994
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7030 DATA 0A,CD,15,5C,06,5A,CD,19,654
7040 DATA BD,10,FB,3E,00,CD,90,BB,1054
7050 DATA 21,00,05,11,00,00,CD,31,309
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7080 DATA 84,58,CD,09,BB,CD,09,BB,1022
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7110 DATA 5B,65,3E,00,32,95,5A,2A,585
7120 DATA 92,5A,7E,CB,3F,CB,3F,CB,1097
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7420 DATA DD,E1,DD,36,01,03,DD,36,1000
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7450 DATA EB,03,7A,FE,0A,D2,A6,5E,1094
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7590 DATA C3,A6,5E,36,02,C3,C7,5E,999
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7960 DATA 21,10,81,3A,84,58,A7,CA,825
7970 DATA E9,66,47,11,DC,00,19,10,684
7980 DATA FD,11,F9,58,01,DC,00,ED,1065
7990 DATA B0,06,14,C5,CD,56,5E,11,801
8000 DATA ***
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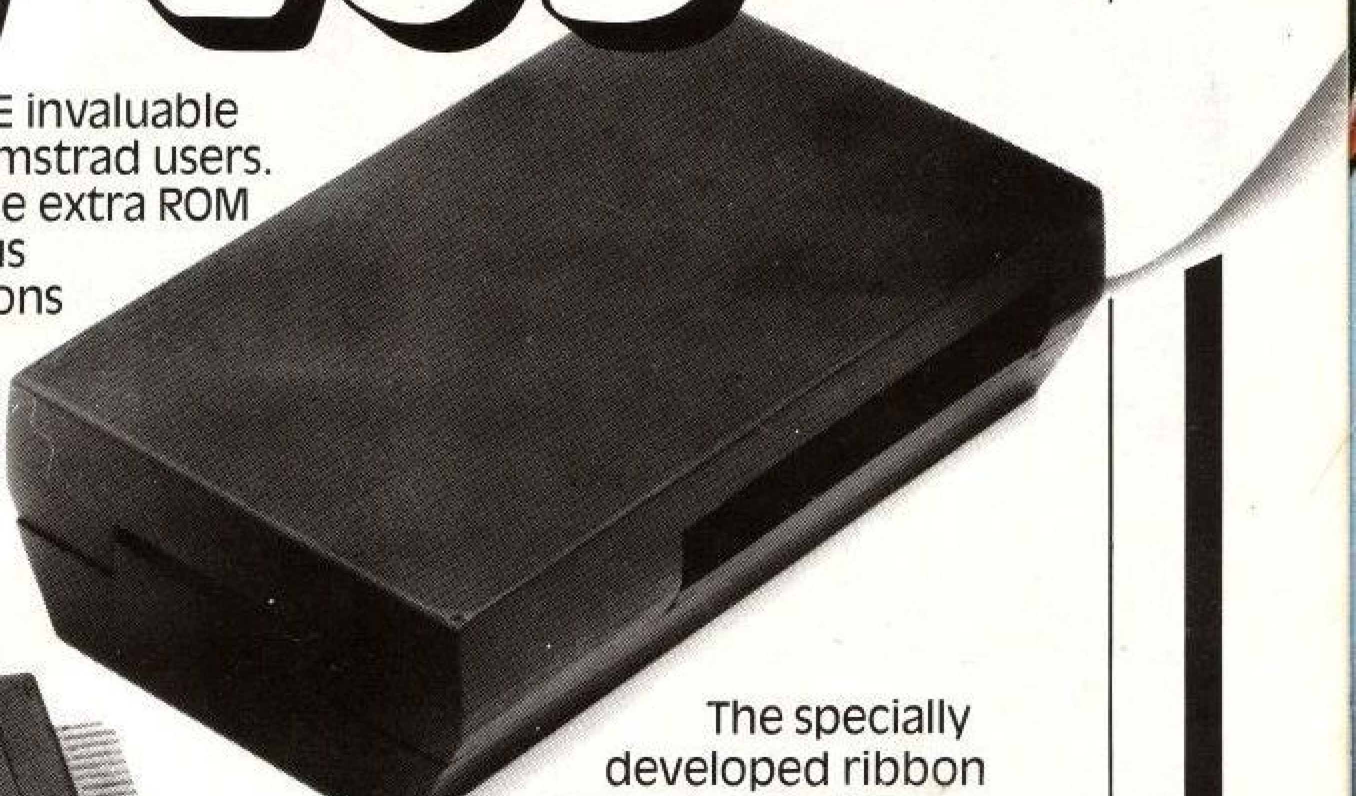
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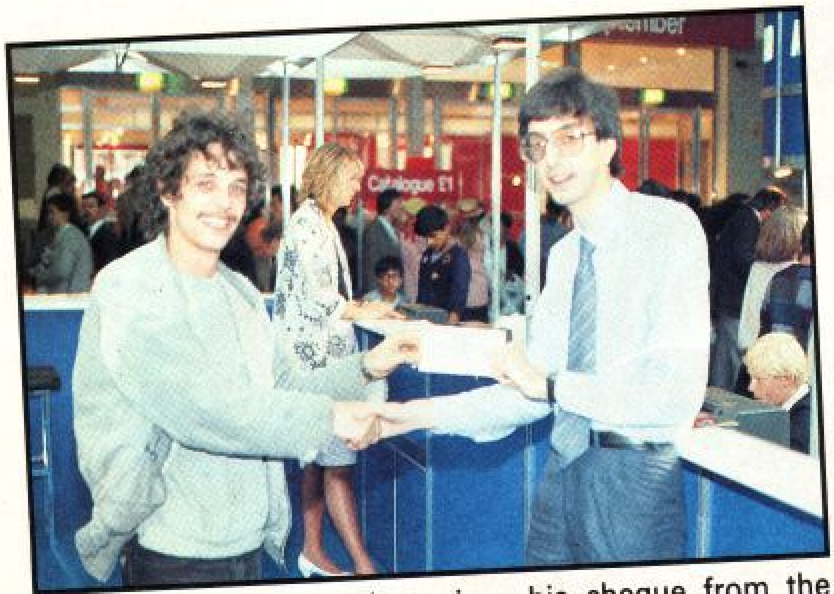
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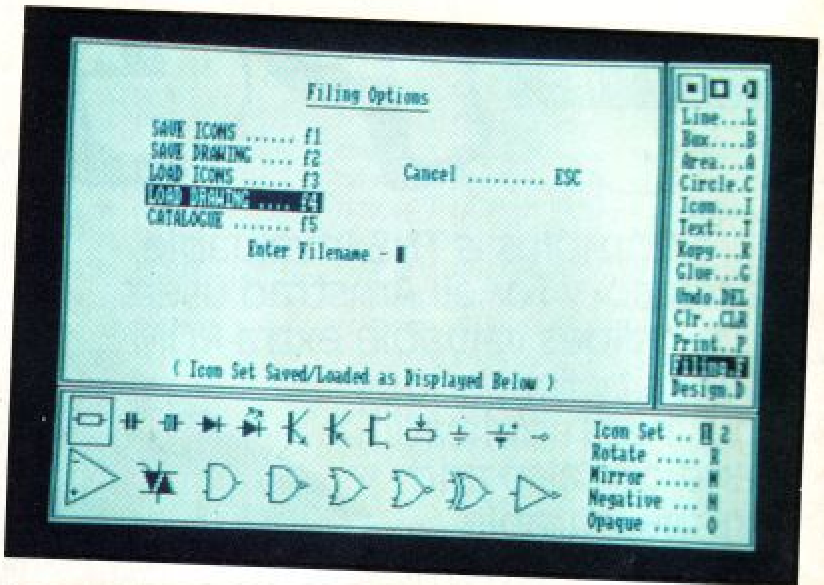
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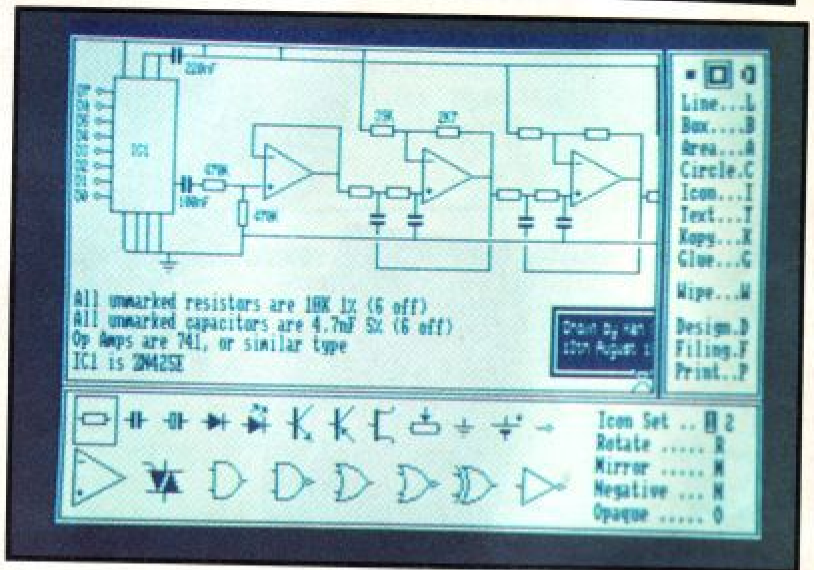
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Amsoft's £2000 Software Competition



Simon Hargreaves (left) receives his cheque from the editor

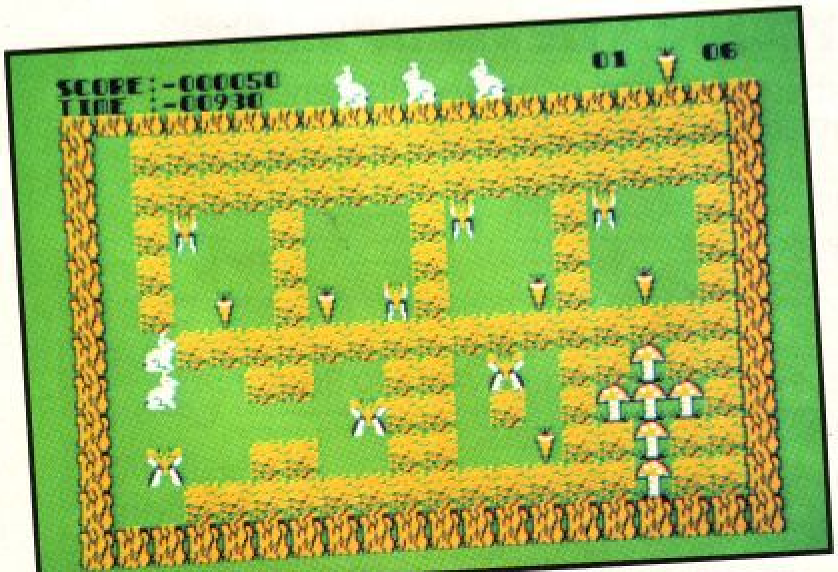




Simon Hargreaves - Micro Draft

As the months progress, the standard of the entries for the £2,000 software competition improves with leaps and bounds. Programs which would have won in previous months are now vying for a place in the rankings. That said, there were two programs which outshone the others to such an extent that only a first and second prize were awarded.

The winner, Simon Hargreaves, is shown here with the bigger smile receiving a cheque for £1,500 from the editor at the PCW show. His winning entry was 'Micro-Draft'. The program won favour in the technical department at Amsoft for drawing up simple circuit diagrams. The documentation was well written and easy to follow, with lots of simple examples. There is a good chance that Amsoft will release 'Micro Draft' to a wider audience. The program is in the main a screen designer for Mode 2, the unusual features are standard icons and the ability to print more than is shown on the screen. Simon Hargreaves is using his winnings to set himself up in business as a programmer.



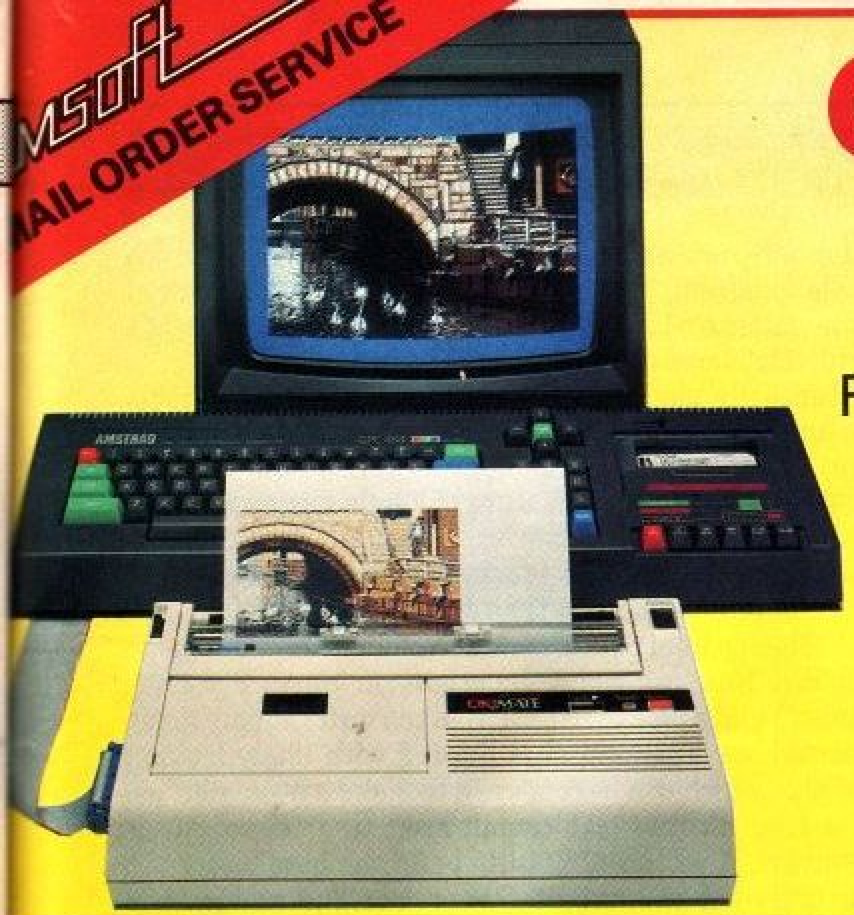
Mark Roberts - Splatch

Mark Roberts won the second prize for his rabbit game. 'Splatch' earned him all of the remaining £500. The plot is very similar to that of 'Boulder Dash' You have to dig through the earth and collect various items of treasure. In the case of Splatch you are a rabbit and the treasure takes the form of carrots. All the important elements are included in the game, rocks are replaced by acorns and butterflies by squirrels. The screens do not scroll and your rabbit is not animated. The differences are enough to make 'Splatch' a game in its own right with enough tricks and routes to learn to keep you amused for hours. If there is an area for complaint, the controls respond too slowly. A decorative title screen makes a great final touch.

All the money spent, it is only possible to congratulate the runners up on a fine effort.

Mike Smith produced a flexible ladders and platforms game designer. Included with it was a sample game called 'Tillies Education', some of the locations bore an

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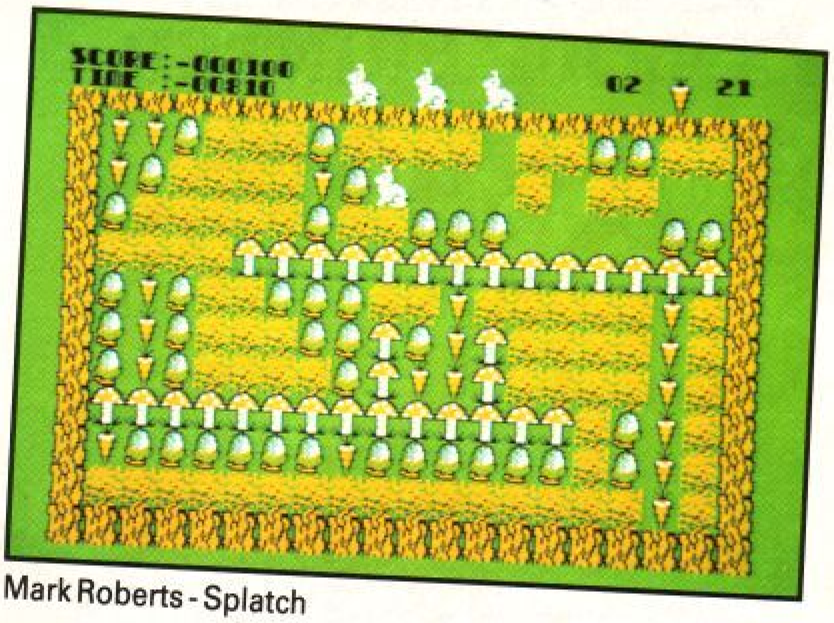
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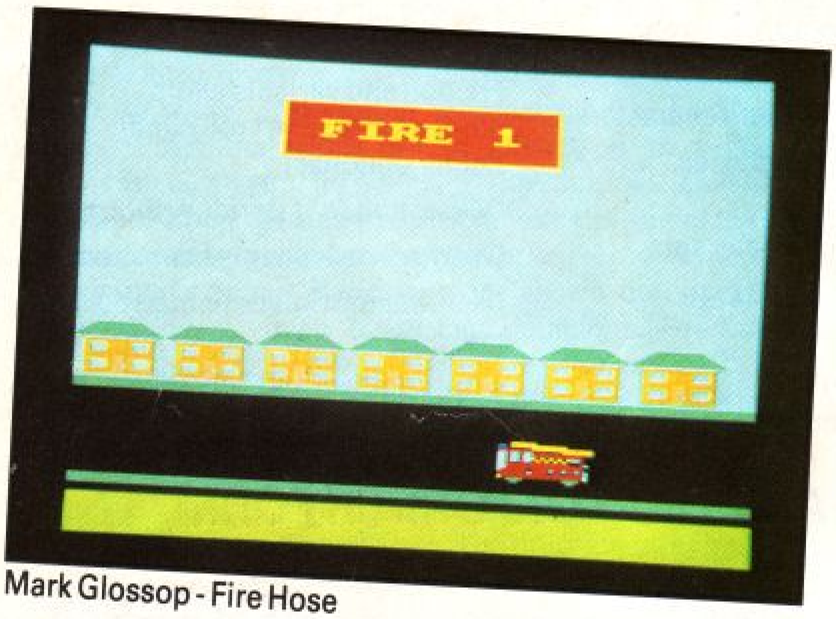
Mark Roberts - Splatch

uncomfortably close resemblance to the rooms in Jet Set Willy. The program contains some nifty sprite routines. As with any general designer program, it is necessary for the user to make some careful notes, the most important addition to the program is a large quantity of graph paper.

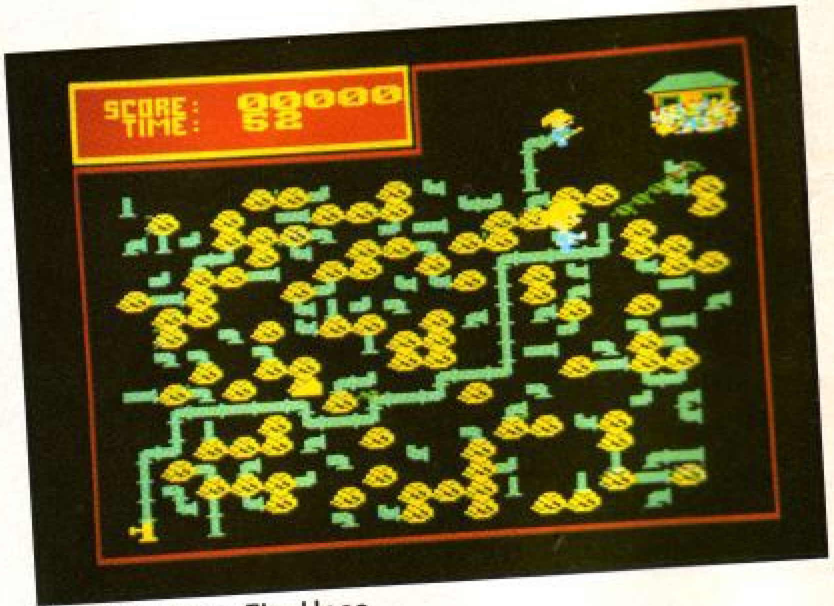
The best of the ordinary utilities was 'Zippy', an assembler development system by J. Kenearlly, the only one of the runners-up to be written without any machine code. The system consists of three programs: the assembler itself, a monitor program and a disassembler. Complete with an example program, 'Zippy' was a solid entry, it lacked documentation and did not use 100% kosher mnemonics but was still considered useful by the program judges.

Mr Kenearlly just missed the last competition with his adventure game 'Commons Crisis' so this was held over for a month. 'Commons Crisis' is a (not very funny - Ed) satirical adventure with the novel feature of single key commands. Press G and you Get whatever is avalaible. The pretty picture of the Telecom Tower does not change and seems to be there more for decoration than anything else.

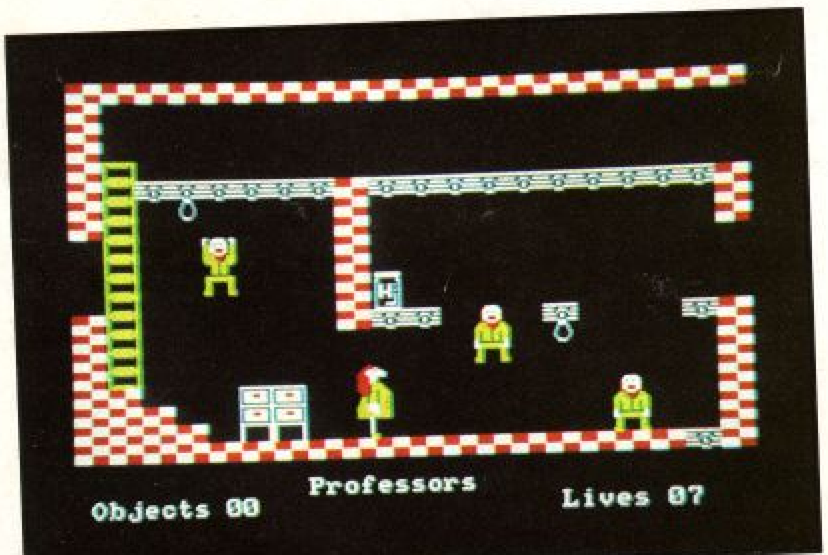
Mark Glossop from South Yorkshire submitted a fun game called 'Fire Hose' which has its origins in 'Super Pipeline'. You must build a pipe to stretch from the water supply to the fireman's hose. The ground is littered with likely looking bits of pipe which can be combined to make a hose, your job title is after all that of Fireman Fred HPT (Hose Putter Togetherer). If you should fail to build the hose before the house is gutted you will lose your job. The problems of finding the correct pieces are exasperated by myriad mole hills which have to worked around leaky pipes and a pesky mole which will break the links. The fireman is a large multi-coloured sprite, the programming is up to scratch and the game fun. We hope to list the game in a future issue.



Mark Glossop - Fire Hose



Mark Glossop - Fire Hose



Mike Smith - Games Designer



J. Kenearlly - Commons Crisis

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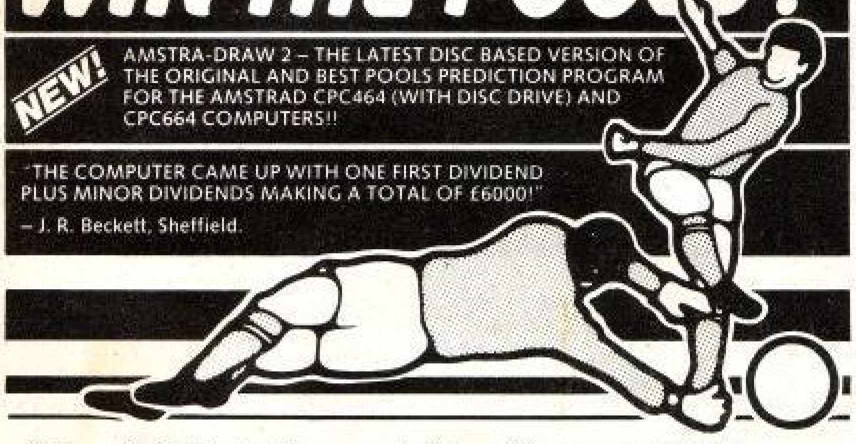
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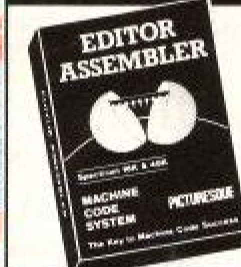
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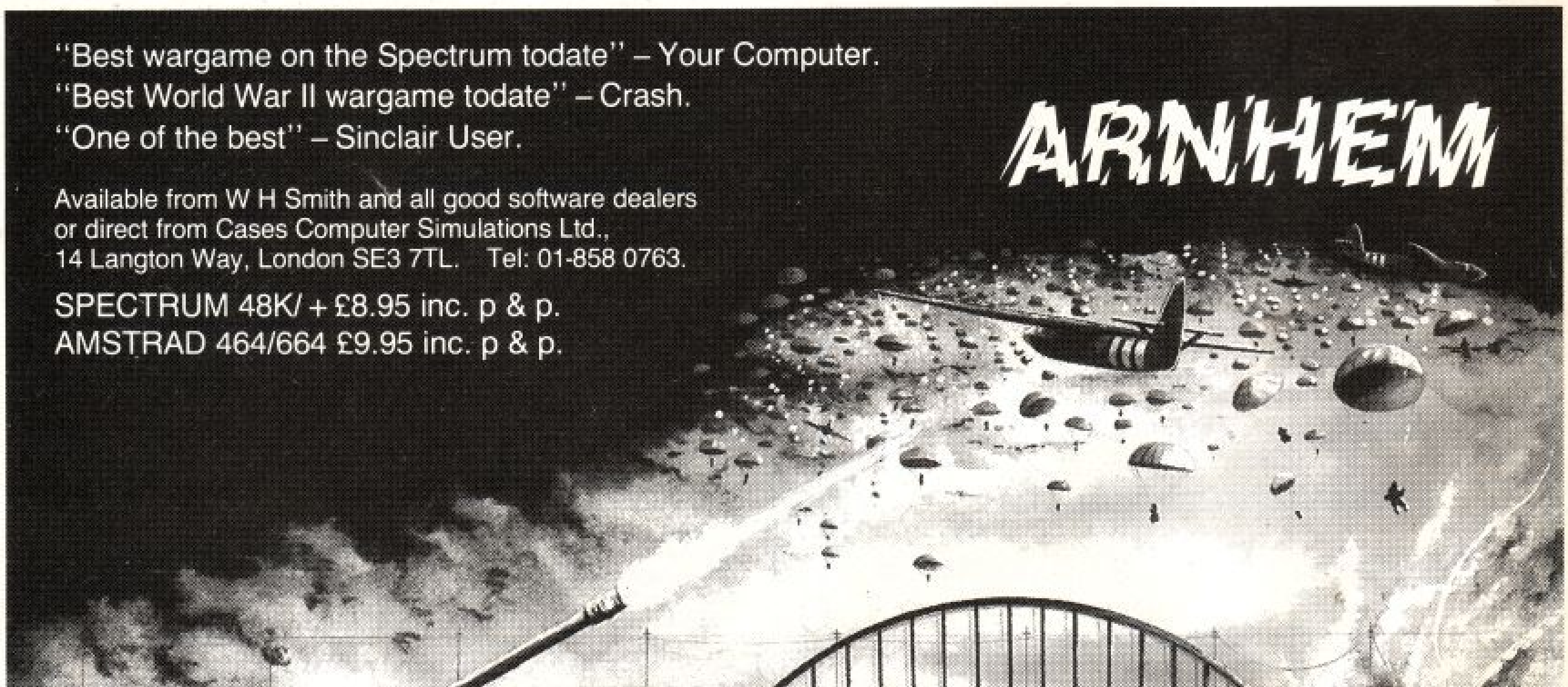
The book discusses, in some detail, the most successful Expert Systems developed to date (including PROSPECTOR, MYCIN and DENDARL) and shows how the field has developed over the past decade. Ready-to-run Expert Systems programs in the book include AUTO MECHANIC and MEDICI (to give yourself a quick 'stress check'). The major Expert System in the book delights in the name of FUZZY RITA. This program uses fuzzy logic within the framework of an Expert System shell to produce a genuinely useful expert on just about any subject you choose, from chicken sexing through to medical diagnosis and weather forecasting. You'll also be given the chance to explore the languages which dominate the Artificial Intelligence and Expert Systems worlds. The book contains BASIC emulators of PROLOG and LISP so you can get them up and running on your computer, without having to actually buy the languages.

Exploring Expert Systems on your Microcomputer, by Tim Hartnell (ISBN 0 907563 74 0), is £7.95, and is available from most book and computer stores, or you can get it direct by mail, post free, from the publishers:

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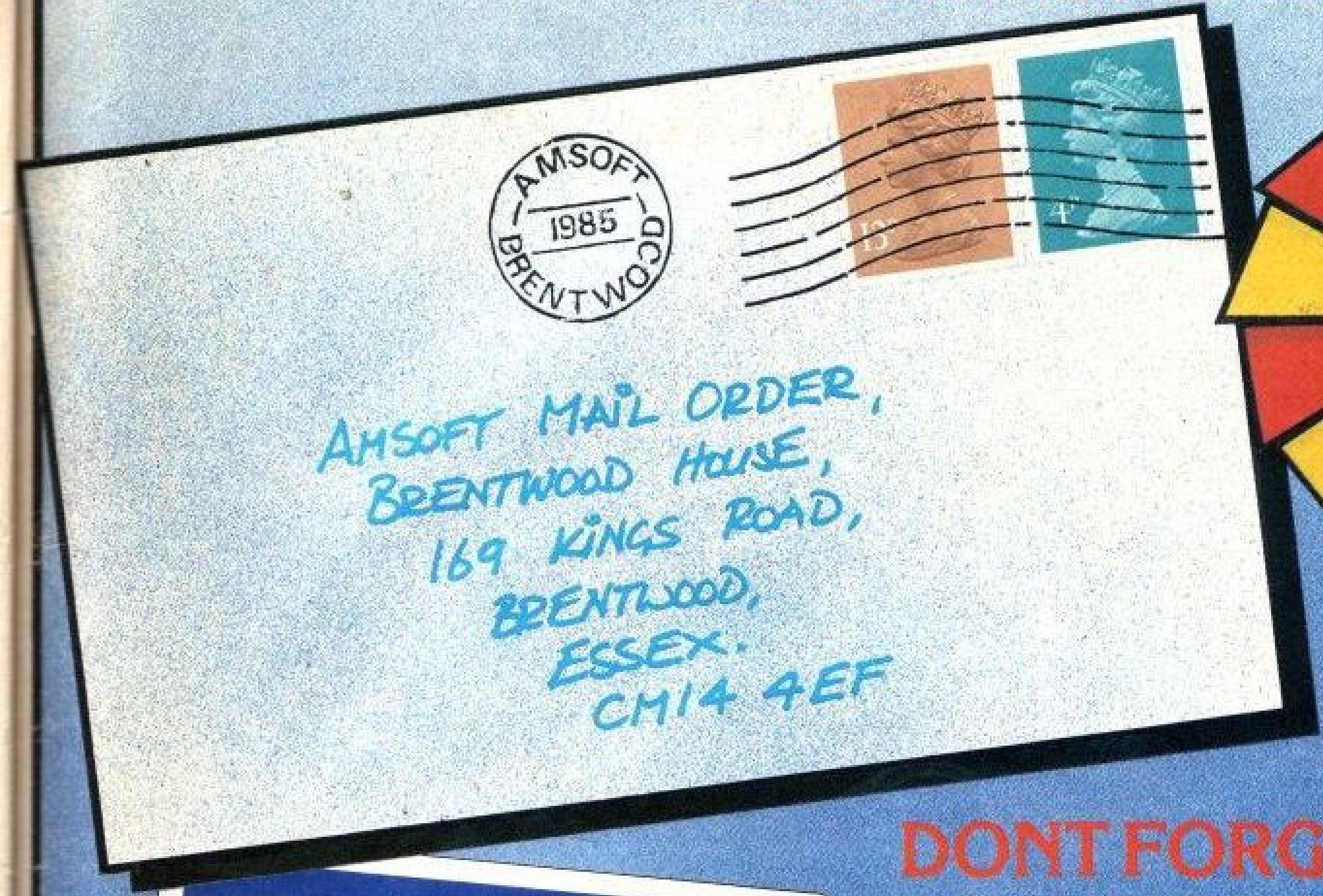
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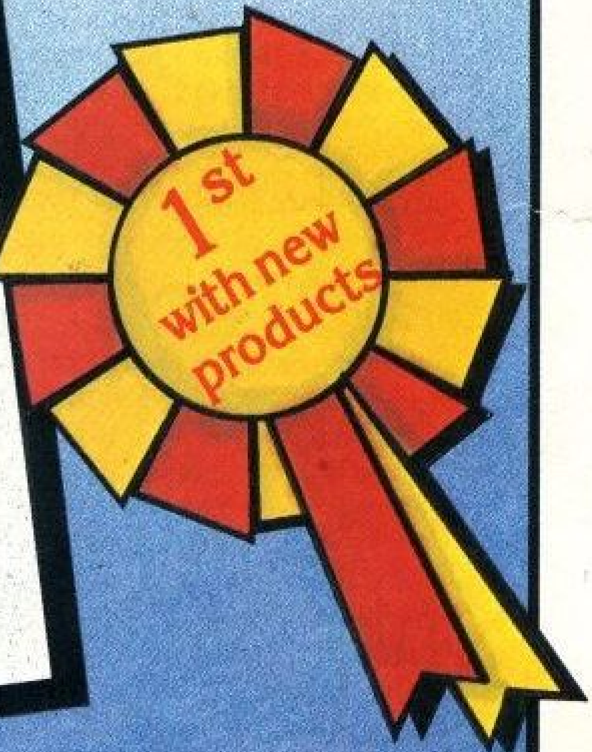


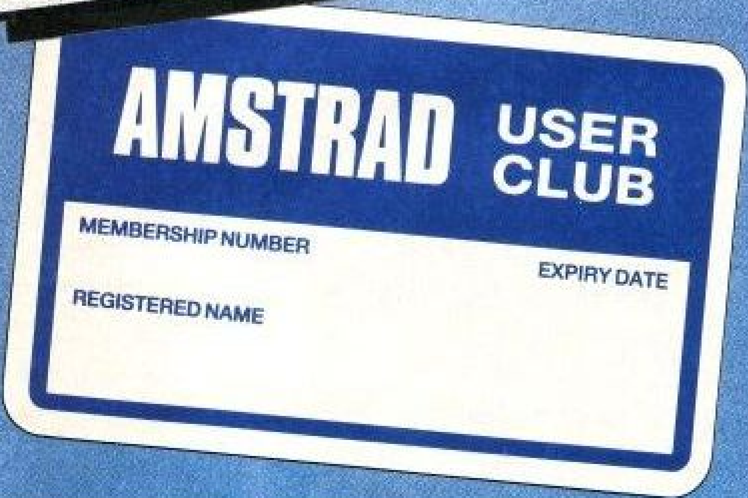
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The Least Significant Bit

Exclusive: No new machines from Amstrad this year!

We can positively state without fear of contradiction that Amstrad will not be introducing any new computers this year. Rumours of new workstations with 16 286s operating in bit-slice mode with 80MBytes of RAM are entirely without foundation.

Least said soonest mended?

Amstrad regards marketing information as its most precious asset, and, as such, this information is distributed on a very selective basis. Much to the chagrin of the press (and us), journalists do not figure highly on the list of those who need to know about confidential internal planning.

The decision to divert the CPC6128 to the UK market this year was taken in response to market requirements (the competition are no respecters of fair play). The fact that the CPC6128 brochures were only available some 3 weeks after the product first arrived in the UK bears out this point.

The CPC664 has just as much utility now as it did when first launched. In fact, rather more, since the software and support base for all our systems is expanding. But, whenever a new product is launched, there will be those who will be in the unfortunate position of just having bought the old one.

The computer market is littered with paradoxes: IBM is presently being hounded for failing to introduce the PC II, Sinclair is being praised in the press for the marketing deals with Dixons (too bad if you bought £400 QL or you are long standing independent supporter of Sinclair products), the gradual realignment of Acorn has been allowed to undermine schools' computer education without much adverse comment.

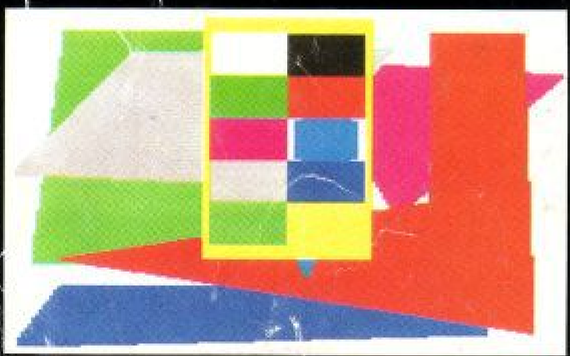
The Soft Machine

The PCW8256 is entirely soft. This doesn't mean the plastic hasn't set yet, but that there is no ROM inside. Thus armed with details of the hardware specification and the disc boot procedure, creative software houses might be able to do quite innovative and dramatic things.

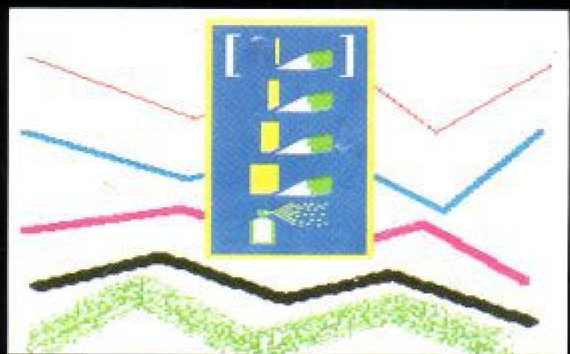
While we would rather you didn't make copies of this magazine, it would be a good idea to do so with your system discs if you have just bought a 6128. This is especially true if you are hoping to access the CP/M PLUS Logo. The SUBMIT command used to invoke this will not work on a write protected disc, so you must make a copy before using it. Anyone who's really impatient could type the two submitted commands separately (that is, SETKEYS KEYS.DRL followed by LOGO3).

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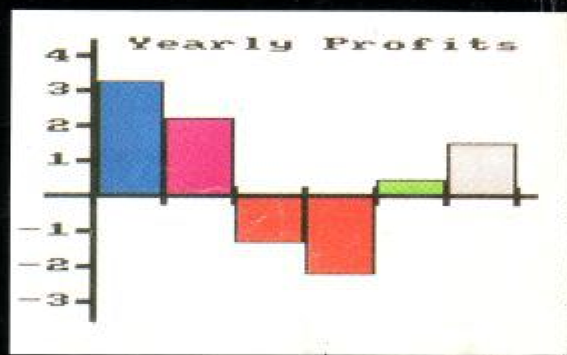




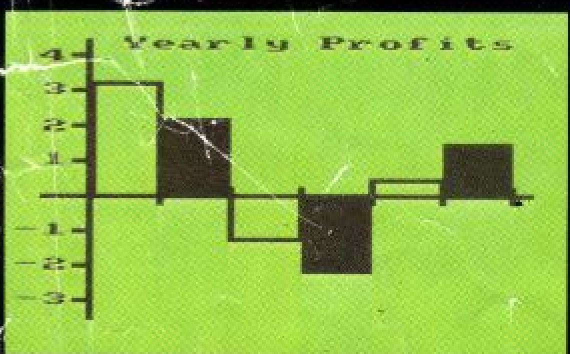
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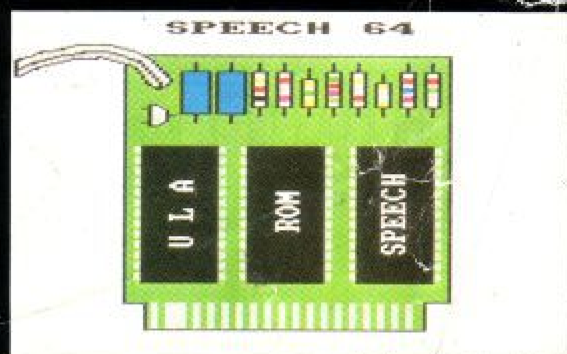
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